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TECHNICAL NOTE

No. 1778

DIRECT-READING DESIGN CHARTS FOR 24S-T ALUMINUM-ALLOY
FLAT COMPRESSION PANELS HAVING LONGITUDINAL
FORMED Z-SECTION STIFFENERS

By Norris F. Dow and Albert S. Keevil, Jr.

Langley Aeronautical Laboratory
Langley Field, Va.



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SUMMARY

Direct-reading design charts are presented for 24S-T aluminum-alloy flat compression panels having longitudinal formed Z-section stiffeners. These charts make possible the direct determination of the stress and all the panel proportions required to carry a given intensity of loading with a given skin thickness and effective length of panel.

INTRODUCTION

Design charts for wing compression panels have been presented in several different forms. (See references 1 and 2.) In reference 3, a form was developed which permitted the direct selection of proportions for given values of the principal design conditions - intensity of loading, skin thickness, and effective length of panel. This form also made possible the ready determination of the proportions having minimum weight to meet these conditions. The charts presented in reference 3 covered 75S-T aluminum-alloy flat compression panels having longitudinal straight-web Y-section stiffeners. Similar charts for 24S-T aluminum-alloy panels with extruded, straight-web Y-section stiffeners are presented in reference 4, and direct-reading design charts for 24S-T aluminum-alloy panels with formed Z-section stiffeners are presented herein.

SYMBOLS

The symbols used for the panel dimensions are given in figure 1. In addition, the following symbols are used:

- c coefficient of end fixity as used in Euler column formula
- d rivet diameter, inches
- L length of panel, inches

p	rivet pitch, inches
P_1	compressive load per inch of panel width, kips per inch
$\bar{t}$	cross-sectional area per inch of panel width, expressed as an equivalent or average thickness, inches
ρ	radius of gyration, inches
$\bar{\sigma}_f$	average stress at failing load, ksi
σ_{cr}	stress for local buckling of sheet, ksi
σ_{cy}	compressive yield stress, ksi

DIRECT-READING DESIGN CHARTS

Direct-reading design charts for 24S-T aluminum-alloy flat compression panels with longitudinal formed Z-section stiffeners having the properties and proportions given in tables 1 to 5 are presented in two forms in figures 2 to 9. In the first form (figs. 2 to 5), the design conditions of intensity of loading, effective length of panel, and skin thickness

are incorporated in the ordinate P_1/t_S and the abscissa $\frac{P_1}{L/\sqrt{c}}$. This

form, having the design conditions incorporated in the ordinate and abscissa, is the more useful for most design purposes because the curves are more widely spaced and interpolation is more straightforward. In the second (alternate) form (figs. 6 to 9), the average stress at failure $\bar{\sigma}_f$ is plotted against P_1/t_S as was done in the summary plots of reference 5. This alternate form, having the stress - an inverse measure of weight for a given load - as ordinate, is the more useful for making generalizations and comparisons of structural efficiency because it shows how nearly the stress actually carried approaches the upper limit corresponding to the stress that would be achieved by a pure shell construction if a pure shell could carry the load without failure.

This upper limit of stress is represented by the lines for $\bar{\sigma}_f = \frac{P_1}{t_S}$ (infinite stiffener spacing) in figures 6 to 9.

Values of the ratios of stiffener thickness to skin thickness t_w/t_S , spacing of rivet lines to skin thickness S/t_S (because there is one rivet line associated with each Z-section, the stiffener spacing b_S is equal to S , the spacing of rivet lines), and height of stiffener to stiffener thickness H/t_w , which will satisfy the design conditions, may be found directly from these charts, and the corresponding section properties $\bar{t}/t_S$, $\bar{h}/t_S$, and ρ/t_S may be found from tables 2 to 5. In

the first form of design chart (figs. 2 to 5) dashed lines are used to indicate values of average stress at failure $\bar{\sigma}_F$; whereas, on the alternate form of design chart (figs. 6 to 9) dashed lines are used to indicate values of $\frac{P_i}{L/\sqrt{c}}$. In both forms the value of $\bar{\sigma}_F$ corresponding to the point at which each curve is cut by a short heavy line is the value of the stress for local buckling σ_{cr} for the proportions represented by the curves. For example, the value of σ_{cr} for $\frac{H}{t_W} = 21$ and $\frac{S}{t_S} = 35$ in figure 2 is approximately 29 ksi. (Only a short panel of these proportions would buckle before failure - one having a value of $\frac{P_i}{L/\sqrt{c}} \geq 0.27$.) If the value of σ_{cr} is so low that the short heavy line would fall outside the boundaries of the chart, a numerical value of σ_{cr} is given and is associated with the proper proportions by a leader to the curve. The panel proportions which have minimum weight are indicated on both forms of these charts by the use of colors as follows:

- (1) If the proportions correspond to a blue region, they are the proportions which give the lightest possible 24S-T Z-stiffened panel which will meet the design conditions
- (2) If the proportions correspond to a red region, they are the lightest possible at the ratio of stiffener thickness to skin thickness given by that particular chart, but some other thickness ratio would give a lighter design
- (3) If the proportions correspond to a white region, the proportions meet the design conditions, but they are not the lightest which will meet the conditions

Because in many cases the proportions may be varied somewhat from those indicated by the red and blue regions with little change in the value of the stress that can be carried, too much importance should not be attached to the exact proportions indicated by the colors to have minimum weight. In any particular case for which a deviation from the minimum-weight proportions is made, however, caution dictates that the weight penalty associated with this deviation be determined.

The direct-reading design charts presented herein were developed in the manner described in reference 3 from the test data and resulting curves given in reference 2.

USE OF THE DIRECT-READING DESIGN CHARTS

The manner of using the direct-reading design charts depends in some measure on the desired degree of precision of interpolation among the curves. For many purposes, interpolation by inspection is of adequate accuracy, and the use of the charts requires only the calculation of the

values of the design parameters P_1/t_S and $\frac{P_1}{L/\sqrt{c}}$ to permit the desired proportions to be read directly from the curves. The proportions for minimum weight, moreover, may be found directly as those corresponding to the blue region on the curves.

If more accurate interpolation is desired, a plot can readily be made of H/t_W , $\bar{\sigma}_F$, and σ_{cr} against S/t_S at the given values of P_1/t_S and $\frac{P_1}{L/\sqrt{c}}$ and the proportions can be picked from it. (This plot is

similar to that which results from the use of the minimum-weight design procedure with the previously available design charts as illustrated in reference 2.) On a plot of this type, the proportions for minimum weight correspond to those associated with the highest value of $\bar{\sigma}_F$.

As a check on the accuracy of interpolation, the cross-sectional area per inch of width of the design may be determined from the values of $\bar{t}/t_S$ given in tables 2 to 5 and the value of the intensity of loading P_1 that can be carried on this cross-sectional area per inch at the value of $\bar{\sigma}_F$ given by the charts may then be compared with the design value of P_1 .

ILLUSTRATIVE EXAMPLE

In order to illustrate the use of the direct reading design charts and the simplicity of the computations associated with them, a panel will be designed for minimum weight to meet the same principal design conditions used to illustrate the design procedures in reference 2, namely:

- (1) Intensity of loading $P_1 = 3.0$ kips per inch
- (2) Skin thickness $t_S = 0.064$ inch
- (3) Effective length $L/\sqrt{c} = 20$ inches

First the values of P_1/t_S and $\frac{P_1}{L/\sqrt{c}}$ are calculated

$$\begin{aligned}\frac{P_1}{t_S} &= \frac{3.0}{0.064} \\ &= 46.9 \text{ ksi}\end{aligned}$$

$$\begin{aligned}\frac{P_1}{L/\sqrt{c}} &= \frac{3.0}{20/\sqrt{1}} \\ &= 0.15 \text{ ksi}\end{aligned}$$

Then a trial value of t_W/t_S is assumed (for the example $\frac{t_W}{t_S} = 0.79$ will be used). In the chart for this value of t_W/t_S (fig. 4) the points corresponding to the design values of P_1/t_S and $\frac{P_1}{L/\sqrt{c}}$ lie on the red line at $\frac{H}{t_W} = 26$ (or $\frac{b_W}{t_W} = 25$). Accordingly, the value of H/t_W for minimum weight for $\frac{t_W}{t_S} = 0.79$ is 26, and because the value is established by a red line, not a blue line, some value of t_W/t_S other than 0.79 will give less weight. Inspection of the charts for other values of t_W/t_S reveals that at the given design values of P_1/t_S and $\frac{P_1}{L/\sqrt{c}}$ the blue region lies between $\frac{H}{t_W} = 26$ and $\frac{H}{t_W} = 31$ on the chart for $\frac{t_W}{t_S} = 0.63$.

By interpolation, the panel proportions corresponding to this blue region

$$\text{are found to be } \frac{H}{t_W} \approx 29.5 \left(\frac{b_W}{t_W} \approx 28.5 \right) \text{ and } \frac{S}{t_S} = \frac{b_S}{t_S} \approx 35,$$

and for these proportions $\bar{\sigma}_f \approx 30.5 \text{ ksi}$ and $\sigma_{cr} \approx 30.5 \text{ ksi}$, which are the values for minimum weight. The actual panel dimensions can be calculated from these proportions as

$$\begin{aligned}t_W &= \frac{t_W}{t_S} t_S \\ &= 0.63(0.064) \\ &= 0.0403 \text{ inch}\end{aligned}$$

$$\begin{aligned}
 H &= \frac{H}{t_W} t_W \\
 &= 29.5 (0.040) \\
 &= 1.18 \text{ inches}
 \end{aligned}$$

$$\begin{aligned}
 S &= \frac{S}{t_S} t_S \\
 &= 35(0.064) \\
 &= 2.24 \text{ inches}
 \end{aligned}$$

and the section properties can be determined from table 3 as

$$\begin{aligned}
 \bar{h} &= \frac{\bar{h}}{t_S} t_S \\
 &= 3.92(0.064) \\
 &= 0.251 \text{ inch}
 \end{aligned}$$

$$\begin{aligned}
 \rho &= \frac{\rho}{t_S} t_S \\
 &= 6.02(0.064) \\
 &= 0.385 \text{ inch}
 \end{aligned}$$

In order to illustrate the use of the direct-reading design charts when more accuracy than that corresponding to interpolation by inspection is desired, a plot has been made (fig. 10) of the values of $\bar{\sigma}_f$, σ_{cr} , and H/t_W given by the charts at the design values of P_i/t_S and $\frac{P_i}{L/\sqrt{c}}$.

The proportions which give the highest value of $\bar{\sigma}_f$ can be readily selected from a plot of this kind. (For the example these proportions are so nearly the same as were obtained by inspection that the values will not be repeated.)

As a check on the accuracy of interpolation, the magnitude of $\bar{t}/t_S$ for these proportions can be determined from table 3 and multiplied by the values of t_S and $\bar{\sigma}_f$ for the design. This product should be equal to the design value of P_i . For the example

$$\bar{\sigma}_f = 30.5 \text{ ksi}$$

$$\frac{\bar{t}}{t_S} = 1.538$$

and

$$\begin{aligned} P_i &= \bar{\sigma}_f \bar{t} \\ &= \bar{\sigma}_f \frac{\bar{t}}{t_S} t_S \\ &= 30.5(1.538)(0.064) \\ &= 3.0 \text{ kips per inch} \end{aligned}$$

which agrees with the design value of P_i originally assumed.

Langley Aeronautical Laboratory
National Advisory Committee for Aeronautics
Langley Field, Va., August 2, 1948

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2. Schuette, Evan H.: Charts for the Minimum-Weight Design of 24S-T Aluminum-Alloy Flat Compression Panels with Longitudinal Z-Section Stiffeners. NACA Rep. No. 827, 1945.
3. Dow, Norris F., and Hickman, William A.: Direct-Reading Design Charts for 75S-T Aluminum-Alloy Flat Compression Panels Having Longitudinal Straight-Web Y-Section Stiffeners. NACA TN No. 1640, 1948.
4. Dow, Norris F., Hubka, Ralph E., and Roberts, William M.: Direct-Reading Design Charts for 24S-T Aluminum-Alloy Flat Compression Panels Having Longitudinal Straight-Web Y-Section Stiffeners. NACA TN No. 1777, 1949.
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TABLE 1.- MATERIAL PROPERTIES OF 24S-T
ALUMINUM-ALLOY PANELS HAVING FORMED
Z-SECTION STIFFENERS

	Aluminum alloy	σ_{cy} (ksi)
Sheet	24S-T bare	44.0
Stiffeners	24S-T bare sheet before forming	44.0

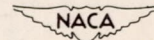


TABLE 2.- Z-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 0.51; \frac{b_A}{t_W} = 11.4; \frac{b_F}{b_W} = 0.4; \frac{r_A}{t_W} = 3; \frac{r_F}{t_S} = 4; \frac{d}{t_S} = 1.50; \frac{p}{t_S} = 10.0 \right]$

$\frac{b_W}{t_S}$	$\frac{b_F}{t_S}$	20	21	22	23	24	25	26	27	28	29	30	31	32
25	1.374	1.389	1.403	1.418	1.432	1.447	1.462	1.476	1.491	1.505	1.520	1.535	1.549	
26	1.360	1.374	1.388	1.402	1.416	1.430	1.444	1.458	1.472	1.486	1.500	1.514	1.528	
27	1.346	1.360	1.373	1.387	1.400	1.414	1.427	1.441	1.454	1.468	1.481	1.495	1.508	
28	1.334	1.347	1.360	1.373	1.386	1.399	1.412	1.425	1.438	1.451	1.464	1.477	1.490	
29	1.323	1.335	1.348	1.360	1.373	1.385	1.398	1.410	1.423	1.436	1.448	1.461	1.473	
30	1.312	1.324	1.336	1.348	1.360	1.373	1.385	1.397	1.409	1.421	1.433	1.445	1.457	
31	1.302	1.313	1.325	1.337	1.349	1.360	1.372	1.384	1.396	1.407	1.419	1.431	1.443	
32	1.292	1.304	1.315	1.326	1.338	1.349	1.361	1.372	1.383	1.395	1.406	1.418	1.429	
33	1.283	1.294	1.306	1.317	1.328	1.339	1.350	1.361	1.372	1.383	1.394	1.405	1.416	
34	1.275	1.286	1.297	1.307	1.318	1.329	1.339	1.350	1.361	1.372	1.382	1.393	1.404	
35	1.267	1.278	1.289	1.298	1.309	1.319	1.330	1.340	1.350	1.361	1.371	1.382	1.392	
36	1.260	1.270	1.280	1.290	1.300	1.310	1.321	1.331	1.341	1.351	1.361	1.371	1.381	
37	1.253	1.263	1.272	1.282	1.292	1.302	1.312	1.322	1.332	1.341	1.351	1.361	1.371	
38	1.246	1.256	1.265	1.275	1.285	1.294	1.304	1.313	1.323	1.332	1.342	1.352	1.361	
39	1.240	1.249	1.259	1.268	1.277	1.287	1.296	1.305	1.315	1.324	1.333	1.343	1.352	
40	1.234	1.243	1.252	1.261	1.270	1.279	1.288	1.298	1.307	1.316	1.325	1.334	1.343	
41	1.228	1.237	1.246	1.255	1.264	1.273	1.282	1.291	1.300	1.309	1.318	1.327	1.336	
42	1.223	1.231	1.240	1.249	1.257	1.266	1.275	1.283	1.292	1.301	1.309	1.318	1.327	
43	1.218	1.226	1.234	1.242	1.250	1.258	1.266	1.274	1.282	1.290	1.298	1.306	1.314	
44	1.213	1.221	1.229	1.237	1.245	1.253	1.261	1.269	1.277	1.285	1.293	1.301	1.309	
45	1.208	1.216	1.224	1.232	1.240	1.248	1.256	1.264	1.272	1.280	1.288	1.296	1.304	
46	1.203	1.211	1.219	1.227	1.235	1.243	1.251	1.259	1.267	1.275	1.283	1.291	1.299	
47	1.198	1.206	1.214	1.222	1.230	1.238	1.246	1.254	1.262	1.270	1.278	1.286	1.294	
48	1.193	1.201	1.209	1.217	1.225	1.233	1.241	1.249	1.257	1.265	1.273	1.281	1.289	
49	1.188	1.196	1.204	1.212	1.220	1.228	1.236	1.244	1.252	1.260	1.268	1.276	1.284	
50	1.183	1.191	1.199	1.207	1.215	1.223	1.231	1.239	1.247	1.255	1.263	1.271	1.279	
51	1.178	1.186	1.194	1.202	1.210	1.218	1.226	1.234	1.242	1.250	1.258	1.266	1.274	
52	1.173	1.181	1.189	1.197	1.205	1.213	1.221	1.229	1.237	1.245	1.253	1.261	1.269	
53	1.168	1.176	1.184	1.192	1.200	1.208	1.216	1.224	1.232	1.240	1.248	1.256	1.264	
54	1.163	1.171	1.179	1.187	1.195	1.203	1.211	1.219	1.227	1.235	1.243	1.251	1.259	
55	1.158	1.166	1.174	1.182	1.190	1.198	1.206	1.214	1.222	1.230	1.238	1.246	1.254	
56	1.153	1.161	1.169	1.177	1.185	1.193	1.201	1.209	1.217	1.225	1.233	1.241	1.249	
57	1.148	1.156	1.164	1.172	1.180	1.188	1.196	1.204	1.212	1.220	1.228	1.236	1.244	
58	1.143	1.151	1.159	1.167	1.175	1.183	1.191	1.199	1.207	1.215	1.223	1.231	1.239	
59	1.138	1.146	1.154	1.162	1.170	1.178	1.186	1.194	1.202	1.210	1.218	1.226	1.234	
60	1.133	1.141	1.149	1.157	1.165	1.173	1.181	1.189	1.197	1.205	1.213	1.221	1.229	
61	1.128	1.136	1.144	1.152	1.160	1.168	1.176	1.184	1.192	1.200	1.208	1.216	1.224	
62	1.123	1.131	1.139	1.147	1.155	1.163	1.171	1.179	1.187	1.195	1.203	1.211	1.219	
63	1.118	1.126	1.134	1.142	1.150	1.158	1.166	1.174	1.182	1.190	1.198	1.206	1.214	
64	1.113	1.121	1.129	1.137	1.145	1.153	1.161	1.169	1.177	1.185	1.193	1.201	1.209	
65	1.108	1.116	1.124	1.132	1.140	1.148	1.156	1.164	1.172	1.180	1.188	1.196	1.204	
66	1.103	1.111	1.119	1.127	1.135	1.143	1.151	1.159	1.167	1.175	1.183	1.191	1.200	
67	1.098	1.106	1.114	1.122	1.130	1.138	1.146	1.154	1.162	1.170	1.178	1.186	1.194	
68	1.093	1.101	1.109	1.117	1.125	1.133	1.141	1.149	1.157	1.165	1.173	1.181	1.189	
69	1.088	1.096	1.104	1.112	1.120	1.128	1.136	1.144	1.152	1.160	1.168	1.176	1.184	
70	1.083	1.091	1.099	1.107	1.115	1.123	1.131	1.139	1.147	1.155	1.163	1.171	1.179	
71	1.078	1.086	1.094	1.102	1.110	1.118	1.126	1.134	1.142	1.150	1.158	1.166	1.174	
72	1.073	1.081	1.089	1.097	1.105	1.113	1.121	1.129	1.137	1.145	1.153	1.161	1.169	
73	1.068	1.076	1.084	1.092	1.100	1.108	1.116	1.124	1.132	1.140	1.148	1.156	1.164	
74	1.063	1.071	1.079	1.087	1.095	1.103	1.111	1.119	1.127	1.135	1.143	1.151	1.159	
75	1.058	1.066	1.074	1.082	1.090	1.098	1.106	1.114	1.122	1.130	1.138	1.146	1.154	
76	1.053	1.061	1.069	1.077	1.085	1.093	1.101	1.109	1.117	1.125	1.133	1.141	1.149	
77	1.048	1.056	1.064	1.072	1.080	1.088	1.096	1.104	1.112	1.120	1.128	1.136	1.144	
78	1.043	1.051	1.059	1.067	1.075	1.083	1.091	1.099	1.107	1.115	1.123	1.131	1.139	
79	1.038	1.046	1.054	1.062	1.070	1.078	1.086	1.094	1.102	1.110	1.118	1.126	1.134	
80	1.033	1.041	1.049	1.057	1.065	1.073	1.081	1.089	1.097	1.105	1.113	1.121	1.129	
81	1.028	1.036	1.044	1.052	1.060	1.068	1.076	1.084	1.092	1.100	1.108	1.116	1.124	
82	1.023	1.031	1.039	1.047	1.055	1.063	1.071	1.079	1.087	1.095	1.103	1.111	1.119	
83	1.018	1.026	1.034	1.042	1.050	1.058	1.066	1.074	1.082	1.090	1.098	1.106	1.114	
84	1.013	1.021	1.029	1.037	1.045	1.053	1.061	1.069	1.077	1.085	1.093	1.101	1.109	
85	1.008	1.016	1.024	1.032	1.040	1.048	1.056	1.064	1.072	1.080	1.088	1.096	1.104	
86	1.003	1.011	1.019	1.027	1.035	1.043	1.051	1.059	1.067	1.075	1.083	1.091	1.099	
87	0.998	1.006	1.014	1.022	1.030	1.038	1.046	1.054	1.062	1.070	1.078	1.086	1.094	
88	0.993	1.001	1.009	1.017	1.025	1.033	1.041	1.049	1.057	1.065	1.073	1.081	1.089	
89	0.988	0.996	1.004	1.012	1.020	1.028	1.036	1.044	1.052	1.060	1.068	1.076	1.084	
90	0.983	0.991	0.999	1.007	1.015	1.023	1.031	1.039	1.047	1.055	1.063	1.071	1.079	
91	0.978	0.986	0.994	1.002	1.010	1.018	1.026	1.034	1.042	1.050	1.058	1.066	1.074	
92	0.973	0.981	0.989	0.997	1.005	1.013	1.021	1.029	1.037	1.045	1.053	1.061	1.069	
93	0.968	0.976	0.984	0.992	1.000	1.008	1.016	1.024	1.032	1.040	1.048	1.056	1.064	
94	0.963	0.971	0.979	0.987	0.995	1.003	1.011	1.019	1.027	1.035	1.043	1.051	1.059	
95	0.958	0.966	0.974	0.982	0.990	0.998	1.006	1.014	1.022	1.030	1.038	1.046	1.054	
96	0.953	0.961	0.969	0.977	0.985	0.993	1.001	1.009	1.017	1.025	1.033	1.041	1.049	
97	0.948	0.956	0.964	0.972	0.980	0.988	0.996	1.004	1.012	1.020	1.028	1.036	1.044	
98	0.943	0.951	0.959	0.967	0.975	0.983	0.991	0.999	1.007	1.015	1.023	1.031	1.039	
99	0.938	0.946	0.954	0.962	0.970	0.978	0.986	0.994	1.002	1.010	1.018	1.026	1.034	
100	0.933	0.941	0.949	0.957	0.965	0.973	0.981	0.989	0.997	1.005	1.013	1.021	1.029	
101	0.928	0.936	0.944	0.952	0.960	0.968	0.976	0.984	0.992	1.000	1.008	1.016	1.024	
102	0.923	0.931	0.939	0.947	0.955	0.963	0.971	0.979	0.987	0.995	1.003	1.011	1.019	
103	0.918	0.926	0.934	0.942	0.950	0.958	0.966	0.974	0.982	0.990	0.998	1.006	1.014	
104	0.913	0.921	0.929	0.937	0.945	0.953	0.961	0.969	0.977	0.985	0.993	1.001	1.009	
105	0.908	0.916	0.924	0.932	0.940	0.948	0.956	0.964	0.972	0.980	0.988	0.996	1.004	
106	0.903	0.911	0.919	0.927	0.935	0.943	0.951	0.959	0.967	0.975	0.983	0.991	0.999	
107	0.898	0.906	0.914	0.922	0.930	0.938	0.946	0.954	0.962	0.970	0.978	0.986	0.994	
108	0.893	0.901	0.909	0.917	0.925	0.933	0.941	0.949	0.957	0.965	0.973	0.98		

TABLE 2.- Z-PANEL PROPERTIES - Concluded $\left[\frac{t_W}{t_S} = 0.51; \frac{b_A}{t_W} = 11.4; \frac{b_F}{b_W} = 0.4; \frac{r_A}{t_W} = 3; \frac{r_F}{t_S} = 4; \frac{d}{t_S} = 1.50; \frac{p}{t_S} = 10.0 \right]$

$\frac{b_S}{t_S}$	$\frac{t_W}{t_S}$	33	34	35	36	37	38	39	40	41	42	43	44	45
25		1.561	1.578	1.593	1.607	1.622	1.636	1.651	1.665	1.680	1.695	1.710	1.724	1.739
26		1.542	1.556	1.570	1.584	1.598	1.612	1.626	1.640	1.654	1.668	1.682	1.696	1.710
27		1.522	1.535	1.549	1.562	1.576	1.589	1.603	1.616	1.630	1.643	1.657	1.670	1.684
28		1.503	1.516	1.529	1.542	1.555	1.568	1.581	1.594	1.607	1.620	1.633	1.646	1.659
29		1.486	1.498	1.511	1.523	1.536	1.549	1.561	1.574	1.586	1.599	1.612	1.624	1.637
30		1.469	1.482	1.493	1.506	1.517	1.530	1.543	1.555	1.567	1.579	1.591	1.603	1.615
31		1.455	1.466	1.479	1.490	1.502	1.513	1.525	1.537	1.549	1.560	1.572	1.584	1.596
32		1.441	1.452	1.464	1.474	1.486	1.497	1.509	1.520	1.532	1.543	1.554	1.565	1.577
33		1.427	1.438	1.449	1.460	1.471	1.482	1.493	1.504	1.515	1.526	1.537	1.548	1.559
34		1.415	1.425	1.436	1.446	1.457	1.468	1.479	1.489	1.500	1.511	1.522	1.532	1.543
35		1.403	1.413	1.424	1.434	1.445	1.455	1.465	1.475	1.486	1.496	1.507	1.517	1.528
36		1.391	1.401	1.411	1.422	1.432	1.442	1.452	1.462	1.472	1.482	1.493	1.503	1.513
37		1.381	1.391	1.401	1.410	1.420	1.430	1.440	1.450	1.460	1.469	1.479	1.489	1.499
38		1.371	1.380	1.390	1.399	1.409	1.419	1.429	1.438	1.448	1.457	1.467	1.476	1.486
39		1.362	1.371	1.380	1.389	1.399	1.408	1.418	1.427	1.436	1.445	1.455	1.464	1.474
40		1.352	1.361	1.370	1.380	1.389	1.398	1.407	1.416	1.425	1.434	1.443	1.452	1.462
42		1.336	1.344	1.353	1.362	1.370	1.379	1.388	1.396	1.405	1.413	1.422	1.431	1.440
44		1.321	1.328	1.337	1.345	1.354	1.362	1.370	1.378	1.387	1.395	1.403	1.411	1.420
46		1.306	1.314	1.322	1.330	1.338	1.346	1.354	1.362	1.370	1.377	1.385	1.393	1.401
48		1.294	1.301	1.309	1.316	1.324	1.331	1.339	1.347	1.355	1.362	1.370	1.377	1.385
50		1.281	1.289	1.297	1.304	1.311	1.318	1.326	1.333	1.340	1.347	1.355	1.362	1.369
52		1.271	1.278	1.285	1.292	1.299	1.306	1.313	1.320	1.327	1.334	1.341	1.348	1.355
54		1.261	1.268	1.274	1.281	1.288	1.295	1.302	1.308	1.315	1.322	1.329	1.335	1.342
56		1.252	1.258	1.265	1.271	1.278	1.284	1.291	1.297	1.304	1.310	1.317	1.323	1.330
58		1.241	1.249	1.256	1.262	1.268	1.274	1.281	1.287	1.293	1.299	1.305	1.312	1.318
60		1.235	1.241	1.247	1.253	1.259	1.265	1.271	1.277	1.283	1.289	1.295	1.302	1.308
65		1.217	1.222	1.228	1.234	1.239	1.245	1.250	1.256	1.262	1.267	1.273	1.278	1.284
70		1.201	1.206	1.211	1.217	1.222	1.227	1.233	1.238	1.243	1.248	1.253	1.258	1.264
75		1.188	1.193	1.198	1.202	1.208	1.212	1.217	1.222	1.227	1.232	1.237	1.241	1.246
25		3.876	4.049	4.223	4.402	4.581	4.766	4.950	5.140	5.329	5.520	5.713	5.913	6.110
26		3.792	3.961	4.132	4.306	4.483	4.663	4.844	5.028	5.216	5.405	5.597	5.790	5.986
27		3.712	3.878	4.045	4.217	4.389	4.566	4.744	4.926	5.108	5.295	5.482	5.670	5.865
28		3.637	3.799	3.963	4.131	4.301	4.474	4.649	4.827	5.007	5.190	5.375	5.562	5.751
29		3.563	3.723	3.884	4.049	4.215	4.384	4.557	4.731	4.909	5.087	5.268	5.453	5.638
30		3.495	3.649	3.811	3.970	4.137	4.301	4.468	4.640	4.814	4.991	5.170	5.351	5.535
31		3.426	3.581	3.733	3.894	4.054	4.220	4.385	4.553	4.723	4.899	5.074	5.251	5.430
32		3.362	3.513	3.665	3.824	3.980	4.142	4.303	4.470	4.637	4.808	4.982	5.159	5.344
33		3.303	3.451	3.601	3.754	3.909	4.067	4.228	4.391	4.556	4.724	4.894	5.067	5.241
34		3.244	3.390	3.537	3.689	3.841	3.995	4.152	4.315	4.476	4.641	4.807	4.979	5.149
35		3.188	3.331	3.475	3.623	3.772	3.926	4.082	4.241	4.399	4.563	4.726	4.894	5.061
36		3.136	3.276	3.419	3.562	3.710	3.861	4.014	4.169	4.327	4.487	4.647	4.811	4.978
37		3.083	3.220	3.360	3.505	3.650	3.797	3.947	4.099	4.254	4.411	4.573	4.741	4.898
38		3.034	3.170	3.307	3.449	3.591	3.735	3.882	4.034	4.185	4.342	4.498	4.659	4.820
39		2.985	3.119	3.258	3.394	3.533	3.677	3.821	3.970	4.121	4.275	4.428	4.586	4.743
40		2.941	3.072	3.206	3.340	3.478	3.620	3.763	3.910	4.058	4.209	4.362	4.517	4.671
42		2.852	2.980	3.109	3.243	3.376	3.512	3.650	3.794	3.937	4.085	4.232	4.381	4.533
44		2.771	2.896	3.020	3.149	3.278	3.408	3.547	3.685	3.823	3.965	4.110	4.258	4.404
46		2.697	2.816	2.938	3.062	3.189	3.318	3.449	3.582	3.718	3.859	3.999	4.141	4.285
48		2.625	2.742	2.860	2.982	3.104	3.231	3.358	3.487	3.618	3.754	3.889	4.030	4.169
50		2.561	2.675	2.786	2.904	3.025	3.147	3.270	3.397	3.527	3.659	3.790	3.926	4.064
52		2.497	2.607	2.719	2.833	2.950	3.069	3.190	3.313	3.439	3.567	3.696	3.828	3.962
54		2.439	2.545	2.655	2.766	2.879	2.995	3.112	3.234	3.356	3.480	3.606	3.736	3.866
56		2.383	2.488	2.593	2.702	2.812	2.926	3.040	3.159	3.277	3.400	3.522	3.649	3.775
58		2.329	2.433	2.535	2.642	2.750	2.861	2.972	3.087	3.204	3.324	3.445	3.566	3.691
60		2.281	2.380	2.482	2.585	2.691	2.799	2.909	3.021	3.135	3.251	3.369	3.486	3.608
65		2.169	2.263	2.358	2.454	2.555	2.656	2.761	2.865	2.972	3.083	3.194	3.309	3.423
70		2.070	2.159	2.249	2.340	2.435	2.531	2.628	2.728	2.831	2.935	3.041	3.149	3.257
75		1.981	2.065	2.150	2.239	2.326	2.419	2.512	2.607	2.704	2.802	2.902	3.007	3.110
25		5.805	6.030	6.255	6.481	6.706	6.932	7.158	7.385	7.611	7.837	8.064	8.291	8.517
26		5.757	5.981	6.205	6.429	6.655	6.880	7.105	7.334	7.557	7.790	8.010	8.236	8.463
27		5.709	5.933	6.155	6.380	6.603	6.829	7.053	7.279	7.504	7.730	7.955	8.182	8.408
28		5.663	5.885	6.107	6.330	6.554	6.778	7.002	7.227	7.452	7.677	7.902	8.128	8.354
29		5.616	5.838	6.059	6.282	6.504	6.727	6.951	7.175	7.400	7.624	7.848	8.074	8.299
30		5.572	5.791	6.013	6.234	6.457	6.679	6.900	7.124	7.347	7.572	7.796	8.021	8.246
31		5.526	5.746	5.965	6.186	6.406	6.629	6.851	7.074	7.297	7.521	7.744	7.968	8.192
32		5.483	5.701	5.919	6.141	6.360	6.581	6.802	7.024	7.246	7.469	7.693	7.917	8.140
33		5.441	5.659	5.876	6.095	6.315	6.534	6.755	6.976	7.198	7.420	7.643	7.866	8.089
34		5.398	5.615	5.832	6.051	6.269	6.488	6.707	6.929	7.149	7.370	7.592	7.815	8.037
35		5.357	5.573	5.788	6.006	6.223	6.442	6.661	6.881	7.101	7.322	7.542	7.766	7.986
36		5.313	5.532	5.748	5.963	6.180	6.397	6.616	6.832	7.054	7.275	7.494	7.715	7.937
37		5.278	5.491	5.705	5.921	6.137	6.353	6.570	6.788	7.007	7.225	7.447	7.663	7.888
38		5.239	5.452	5.665	5.880	6.094	6.309	6.525	6.743	6.960	7.180	7.399	7.619	7.839
39		5.200	5.412	5.621	5.838	6.052	6.267	6.482	6.699	6.916	7.135	7.352	7.572	7.790
40		5.164	5.375	5.586	5.797	6.011	6.225	6.440	6.656	6.872	7.089	7.307	7.526	7.743
42		5.091	5.290	5.509	5.720	5.931	6.143	6.356	6.571	6.785	6.990	7.213	7.434	7.651
44		5.021	5.229	5.435	5.644	5.853	6.065	6.260	6.469	6.701	6.915	7.112	7.346	7.561
46		4.955	5.159	5.365	5.571	5.779	5.988	6.198	6.408	6.620	6.833	7.047	7.260	7.475
48		4.886	5.093	5.296	5.501	5.707	5.915	6.123	6.331	6.540	6.752	6.963	7.176	7.389
50		4.828	5.027	5.229	5.433	5.637	5.843	6.048	6.254	6.465	6.675	6.884	7.095	7.308
52		4.767	4.966	5.166	5.368	5.570	5.774	5.979	6.184	6.397	6.599	6.807	7.017	7.227
54		4.709	4.906	5.105	5.304	5.505	5.706	5.909	6.114	6.219	6.525	6.732	6.941	7.149
56		4.652	4.848	5.044	5.243	5.441	5.642	5.843	6.046					

TABLE 3.- Z-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 0.63; \frac{b_A}{t_W} = 10.9; \frac{b_F}{t_W} = 0.4; \frac{r_A}{t_W} = 3; \frac{r_F}{t_W} = 4; \frac{d}{t_S} = 1.84; \frac{p}{t_S} = 12.3 \right]$

$\frac{b_S}{t_S} \frac{t_W}{t_S}$	20	21	22	23	24	25	26	27	28	29	30	31	32
25	1.563	1.585	1.608	1.630	1.652	1.674	1.696	1.719	1.741	1.763	1.785	1.808	1.830
26	1.541	1.563	1.584	1.606	1.627	1.648	1.670	1.691	1.712	1.734	1.755	1.777	1.798
27	1.521	1.542	1.563	1.583	1.604	1.624	1.645	1.665	1.686	1.707	1.727	1.748	1.768
28	1.503	1.523	1.542	1.562	1.582	1.602	1.622	1.642	1.662	1.681	1.701	1.721	1.741
29	1.485	1.505	1.524	1.543	1.562	1.581	1.600	1.620	1.639	1.658	1.677	1.696	1.715
30	1.469	1.488	1.506	1.525	1.543	1.562	1.580	1.599	1.617	1.636	1.654	1.673	1.692
31	1.454	1.472	1.490	1.508	1.526	1.544	1.562	1.580	1.598	1.615	1.633	1.651	1.669
32	1.440	1.457	1.475	1.492	1.509	1.527	1.544	1.561	1.579	1.596	1.614	1.631	1.648
33	1.427	1.443	1.460	1.477	1.494	1.511	1.528	1.544	1.561	1.578	1.595	1.612	1.629
34	1.414	1.430	1.447	1.463	1.479	1.496	1.512	1.528	1.545	1.561	1.577	1.594	1.610
35	1.402	1.418	1.434	1.450	1.466	1.482	1.497	1.513	1.530	1.545	1.561	1.577	1.593
36	1.391	1.406	1.422	1.437	1.453	1.468	1.484	1.499	1.515	1.530	1.545	1.561	1.576
37	1.380	1.395	1.411	1.426	1.441	1.456	1.471	1.486	1.501	1.516	1.531	1.546	1.561
38	1.370	1.385	1.400	1.414	1.429	1.444	1.458	1.473	1.487	1.502	1.517	1.532	1.546
39	1.361	1.375	1.389	1.404	1.418	1.432	1.446	1.461	1.475	1.489	1.503	1.518	1.532
40	1.352	1.366	1.380	1.394	1.408	1.421	1.435	1.449	1.463	1.477	1.491	1.505	1.519
41	1.345	1.358	1.372	1.385	1.398	1.411	1.424	1.438	1.451	1.464	1.478	1.491	1.504
42	1.340	1.353	1.365	1.378	1.390	1.402	1.415	1.428	1.440	1.453	1.466	1.479	1.491
43	1.336	1.348	1.360	1.372	1.384	1.396	1.408	1.420	1.432	1.444	1.456	1.468	1.480
44	1.332	1.344	1.356	1.368	1.380	1.392	1.404	1.416	1.428	1.440	1.452	1.464	1.476
45	1.329	1.341	1.353	1.365	1.377	1.389	1.401	1.413	1.425	1.437	1.449	1.461	1.473
46	1.326	1.338	1.350	1.362	1.374	1.386	1.398	1.410	1.422	1.434	1.446	1.458	1.470
47	1.323	1.335	1.347	1.359	1.371	1.383	1.395	1.407	1.419	1.431	1.443	1.455	1.467
48	1.320	1.332	1.344	1.356	1.368	1.380	1.392	1.404	1.416	1.428	1.440	1.452	1.464
49	1.317	1.329	1.341	1.353	1.365	1.377	1.389	1.401	1.413	1.425	1.437	1.449	1.461
50	1.314	1.326	1.338	1.350	1.362	1.374	1.386	1.398	1.410	1.422	1.434	1.446	1.458
51	1.311	1.323	1.335	1.347	1.359	1.371	1.383	1.395	1.407	1.419	1.431	1.443	1.455
52	1.308	1.320	1.332	1.344	1.356	1.368	1.380	1.392	1.404	1.416	1.428	1.440	1.452
53	1.305	1.317	1.329	1.341	1.353	1.365	1.377	1.389	1.401	1.413	1.425	1.437	1.449
54	1.302	1.314	1.326	1.338	1.350	1.362	1.374	1.386	1.398	1.410	1.422	1.434	1.446
55	1.299	1.311	1.323	1.335	1.347	1.359	1.371	1.383	1.395	1.407	1.419	1.431	1.443
56	1.296	1.308	1.320	1.332	1.344	1.356	1.368	1.380	1.392	1.404	1.416	1.428	1.440
57	1.293	1.305	1.317	1.329	1.341	1.353	1.365	1.377	1.389	1.401	1.413	1.425	1.437
58	1.290	1.302	1.314	1.326	1.338	1.350	1.362	1.374	1.386	1.398	1.410	1.422	1.434
59	1.287	1.299	1.311	1.323	1.335	1.347	1.359	1.371	1.383	1.395	1.407	1.419	1.431
60	1.284	1.296	1.308	1.320	1.332	1.344	1.356	1.368	1.380	1.392	1.404	1.416	1.428
61	1.281	1.293	1.305	1.317	1.329	1.341	1.353	1.365	1.377	1.389	1.401	1.413	1.425
62	1.278	1.290	1.302	1.314	1.326	1.338	1.350	1.362	1.374	1.386	1.398	1.410	1.422
63	1.275	1.287	1.299	1.311	1.323	1.335	1.347	1.359	1.371	1.383	1.395	1.407	1.419
64	1.272	1.284	1.296	1.308	1.320	1.332	1.344	1.356	1.368	1.380	1.392	1.404	1.416
65	1.269	1.281	1.293	1.305	1.317	1.329	1.341	1.353	1.365	1.377	1.389	1.401	1.413
66	1.266	1.278	1.290	1.302	1.314	1.326	1.338	1.350	1.362	1.374	1.386	1.398	1.410
67	1.263	1.275	1.287	1.299	1.311	1.323	1.335	1.347	1.359	1.371	1.383	1.395	1.407
68	1.260	1.272	1.284	1.296	1.308	1.320	1.332	1.344	1.356	1.368	1.380	1.392	1.404
69	1.257	1.269	1.281	1.293	1.305	1.317	1.329	1.341	1.353	1.365	1.377	1.389	1.401
70	1.254	1.266	1.278	1.290	1.302	1.314	1.326	1.338	1.350	1.362	1.374	1.386	1.398
71	1.251	1.263	1.275	1.287	1.299	1.311	1.323	1.335	1.347	1.359	1.371	1.383	1.395
72	1.248	1.260	1.272	1.284	1.296	1.308	1.320	1.332	1.344	1.356	1.368	1.380	1.392
73	1.245	1.257	1.269	1.281	1.293	1.305	1.317	1.329	1.341	1.353	1.365	1.377	1.389
74	1.242	1.254	1.266	1.278	1.290	1.302	1.314	1.326	1.338	1.350	1.362	1.374	1.386
75	1.239	1.251	1.263	1.275	1.287	1.299	1.311	1.323	1.335	1.347	1.359	1.371	1.383
76	1.236	1.248	1.260	1.272	1.284	1.296	1.308	1.320	1.332	1.344	1.356	1.368	1.380
77	1.233	1.245	1.257	1.269	1.281	1.293	1.305	1.317	1.329	1.341	1.353	1.365	1.377
78	1.230	1.242	1.254	1.266	1.278	1.290	1.302	1.314	1.326	1.338	1.350	1.362	1.374
79	1.227	1.239	1.251	1.263	1.275	1.287	1.299	1.311	1.323	1.335	1.347	1.359	1.371
80	1.224	1.236	1.248	1.260	1.272	1.284	1.296	1.308	1.320	1.332	1.344	1.356	1.368
81	1.221	1.233	1.245	1.257	1.269	1.281	1.293	1.305	1.317	1.329	1.341	1.353	1.365
82	1.218	1.230	1.242	1.254	1.266	1.278	1.290	1.302	1.314	1.326	1.338	1.350	1.362
83	1.215	1.227	1.239	1.251	1.263	1.275	1.287	1.299	1.311	1.323	1.335	1.347	1.359
84	1.212	1.224	1.236	1.248	1.260	1.272	1.284	1.296	1.308	1.320	1.332	1.344	1.356
85	1.209	1.221	1.233	1.245	1.257	1.269	1.281	1.293	1.305	1.317	1.329	1.341	1.353
86	1.206	1.218	1.230	1.242	1.254	1.266	1.278	1.290	1.302	1.314	1.326	1.338	1.350
87	1.203	1.215	1.227	1.239	1.251	1.263	1.275	1.287	1.299	1.311	1.323	1.335	1.347
88	1.200	1.212	1.224	1.236	1.248	1.260	1.272	1.284	1.296	1.308	1.320	1.332	1.344
89	1.197	1.209	1.221	1.233	1.245	1.257	1.269	1.281	1.293	1.305	1.317	1.329	1.341
90	1.194	1.206	1.218	1.230	1.242	1.254	1.266	1.278	1.290	1.302	1.314	1.326	1.338
91	1.191	1.203	1.215	1.227	1.239	1.251	1.263	1.275	1.287	1.299	1.311	1.323	1.335
92	1.188	1.200	1.212	1.224	1.236	1.248	1.260	1.272	1.284	1.296	1.308	1.320	1.332
93	1.185	1.197	1.209	1.221	1.233	1.245	1.257	1.269	1.281	1.293	1.305	1.317	1.329
94	1.182	1.194	1.206	1.218	1.230	1.242	1.254	1.266	1.278	1.290	1.302	1.314	1.326
95	1.179	1.191	1.203	1.215	1.227	1.239	1.251	1.263	1.275	1.287	1.299	1.311	1.323
96	1.176	1.188	1.200	1.212	1.224	1.236	1.248	1.260	1.272	1.284	1.296	1.308	1.320
97	1.173	1.185	1.197	1.209	1.221	1.233	1.245	1.257	1.269	1.281	1.293	1.305	1.317
98	1.170	1.182	1.194	1.206	1.218	1.230	1.242	1.254	1.266	1.278	1.290	1.302	1.314
99	1.167	1.179	1.191	1.203	1.215	1.227	1.239	1.251	1.263	1.275	1.287	1.299	1.311
100	1.164	1.176	1.188	1.200	1.212	1.224	1.236	1.248	1.260	1.272	1.284	1.296	1.308
101	1.161	1.173	1.185	1.197	1.209	1.221	1.233	1.245	1.257	1.269	1.281	1.293	1.305
102	1.158	1.170	1.182	1.194	1.206	1.218	1.230	1.242	1.254	1.266	1.278	1.290	1.302
103	1.155	1.167	1.179	1.191	1.203	1.215	1.227	1.239	1.251	1.263	1.275	1.287	1.299
104	1.152	1.164	1.176	1.188	1.200	1.212	1.224	1.236	1.248	1.260	1.272	1.284	1.296
105	1.149	1.161	1.173	1.185	1.197	1.209	1.221	1.233	1.245	1.257	1.269	1.281	1.293
106	1.146	1.158	1.170	1.182	1.194	1.206	1.218	1.230	1.242	1.254	1.266	1.278	1.290
107	1.143	1.155	1.167	1.179	1.191	1.203	1.215	1.227	1.239	1.251	1.263	1.275	1.287
108	1.140	1.152	1.164	1.176	1.188	1.200	1.212	1.224	1.236	1.248	1.260	1.272	1.

TABLE 3.- Z-PANEL PROPERTIES - Concluded $\frac{b_W}{t_S} = 0.63$; $\frac{b_A}{t_W} = 10.9$; $\frac{b_F}{b_W} = 0.4$; $\frac{r_A}{t_W} = 3$; $\frac{r_F}{t_W} = 4$; $\frac{d}{t_S} = 1.84$; $\frac{p}{t_S} = 12.3$

$\frac{b_W}{t_S}$		33	34	35	36	37	38	39	40	41	42	43	44	45
25	$\frac{t}{t_S}$	1.853	1.874	1.397	1.919	1.941	1.963	1.986	2.008	2.030	2.052	2.075	2.097	2.119
26		1.820	1.841	1.362	1.883	1.905	1.926	1.948	1.969	1.991	2.012	2.033	2.054	2.076
27		1.789	1.810	1.331	1.851	1.871	1.892	1.913	1.933	1.954	1.974	1.995	2.015	2.036
28		1.761	1.781	1.301	1.820	1.840	1.860	1.880	1.900	1.920	1.939	1.959	1.979	1.999
29		1.734	1.754	1.273	1.792	1.811	1.830	1.850	1.869	1.888	1.907	1.926	1.945	1.965
30		1.711	1.729	1.748	1.766	1.785	1.803	1.822	1.840	1.859	1.877	1.896	1.914	1.933
31		1.687	1.705	1.723	1.741	1.759	1.777	1.795	1.813	1.831	1.848	1.866	1.884	1.902
32		1.665	1.683	1.701	1.718	1.736	1.753	1.770	1.787	1.805	1.822	1.839	1.857	1.874
33		1.646	1.662	1.679	1.696	1.713	1.730	1.747	1.763	1.780	1.797	1.814	1.831	1.848
34		1.627	1.643	1.660	1.676	1.692	1.708	1.725	1.741	1.758	1.774	1.790	1.806	1.823
35		1.609	1.624	1.640	1.656	1.672	1.688	1.704	1.720	1.736	1.752	1.768	1.783	1.799
36		1.592	1.607	1.623	1.638	1.654	1.669	1.685	1.700	1.716	1.731	1.747	1.762	1.777
37		1.576	1.591	1.606	1.621	1.636	1.651	1.666	1.681	1.696	1.711	1.726	1.741	1.756
38		1.561	1.575	1.590	1.604	1.619	1.634	1.649	1.663	1.678	1.692	1.707	1.721	1.736
39		1.547	1.560	1.575	1.589	1.603	1.617	1.632	1.646	1.660	1.674	1.689	1.703	1.717
40		1.533	1.546	1.560	1.574	1.588	1.602	1.616	1.630	1.644	1.658	1.672	1.685	1.699
41		1.509	1.520	1.534	1.547	1.560	1.573	1.587	1.600	1.613	1.626	1.640	1.653	1.666
42		1.484	1.497	1.510	1.522	1.535	1.547	1.560	1.573	1.586	1.598	1.611	1.623	1.636
43		1.463	1.475	1.487	1.499	1.511	1.523	1.536	1.548	1.560	1.572	1.584	1.596	1.608
44		1.444	1.455	1.467	1.479	1.491	1.502	1.514	1.525	1.537	1.548	1.560	1.571	1.583
45		1.426	1.437	1.448	1.459	1.471	1.482	1.493	1.504	1.515	1.526	1.537	1.548	1.560
50	$\frac{t}{t_S}$	1.410	1.420	1.431	1.442	1.453	1.463	1.474	1.484	1.495	1.506	1.517	1.527	1.538
51		1.394	1.405	1.415	1.425	1.436	1.446	1.457	1.467	1.477	1.487	1.498	1.508	1.518
52		1.380	1.390	1.400	1.410	1.420	1.430	1.440	1.450	1.460	1.470	1.480	1.490	1.500
53		1.368	1.377	1.387	1.396	1.406	1.415	1.425	1.434	1.444	1.453	1.463	1.473	1.483
54		1.356	1.364	1.374	1.383	1.392	1.401	1.411	1.420	1.429	1.438	1.448	1.457	1.466
55		1.328	1.336	1.345	1.353	1.362	1.370	1.379	1.388	1.397	1.405	1.414	1.422	1.431
56		1.304	1.312	1.320	1.328	1.336	1.344	1.352	1.360	1.368	1.376	1.384	1.392	1.400
57		1.285	1.291	1.299	1.306	1.314	1.321	1.329	1.336	1.343	1.351	1.359	1.366	1.373
60		5.814	6.076	6.335	6.603	6.869	7.141	7.412	7.690	7.971	8.254	8.536	8.825	9.116
61		5.702	5.957	6.216	6.477	6.740	7.008	7.276	7.551	7.824	8.104	8.387	8.672	8.956
62		5.597	5.845	6.097	6.356	6.618	6.875	7.152	7.416	7.686	7.963	8.239	8.522	8.803
63		5.493	5.738	5.987	6.244	6.499	6.758	7.020	7.285	7.552	7.827	8.100	8.376	8.654
64		5.396	5.635	5.882	6.132	6.385	6.641	6.897	7.159	7.425	7.693	7.964	8.237	8.509
65		5.296	5.536	5.777	6.024	6.271	6.525	6.779	7.039	7.298	7.564	7.829	8.100	8.370
66		5.207	5.442	5.681	5.923	6.168	6.416	6.668	6.922	7.179	7.444	7.707	7.973	8.241
67		5.121	5.350	5.584	5.823	6.063	6.310	6.559	6.812	7.064	7.323	7.601	7.844	8.111
68		5.032	5.263	5.494	5.729	5.967	6.209	6.453	6.704	6.955	7.208	7.464	7.723	7.984
69		4.950	5.176	5.403	5.636	5.872	6.112	6.352	6.598	6.843	7.095	7.350	7.607	7.864
70		4.871	5.096	5.321	5.550	5.779	6.016	6.254	6.496	6.740	6.987	7.237	7.493	7.749
71		4.795	5.015	5.236	5.463	5.690	5.924	6.157	6.398	6.637	6.883	7.123	7.380	7.635
72		4.722	4.938	5.157	5.380	5.606	5.835	6.063	6.303	6.542	6.783	7.028	7.275	7.525
73		4.650	4.865	5.080	5.302	5.524	5.749	5.977	6.212	6.446	6.687	6.927	7.174	7.419
74		4.580	4.794	5.005	5.223	5.441	5.668	5.892	6.123	6.356	6.593	6.829	7.071	7.316
75		4.515	4.721	4.935	5.149	5.366	5.583	5.809	6.036	6.265	6.498	6.733	6.975	7.216
76		4.387	4.592	4.795	5.004	5.217	5.433	5.649	5.871	6.097	6.325	6.552	6.786	7.023
77		4.270	4.466	4.665	4.870	5.076	5.283	5.500	5.715	5.933	6.157	6.381	6.611	6.840
78		4.158	4.350	4.546	4.744	4.947	5.152	5.357	5.569	5.783	6.001	6.221	6.445	6.671
79		4.052	4.240	4.430	4.622	4.818	5.020	5.222	5.431	5.639	5.853	6.067	6.288	6.507
80	$\frac{t}{t_S}$	3.953	4.136	4.322	4.512	4.702	4.898	5.097	5.300	5.505	5.713	5.922	6.139	6.351
81		3.857	4.038	4.219	4.403	4.590	4.783	4.978	5.178	5.377	5.579	5.785	5.996	6.207
82		3.771	3.943	4.122	4.303	4.485	4.674	4.862	5.056	5.254	5.454	5.653	5.859	6.068
83		3.686	3.856	4.030	4.207	4.387	4.570	4.756	4.945	5.137	5.332	5.530	5.730	5.933
84		3.602	3.771	3.940	4.115	4.290	4.471	4.652	4.840	5.027	5.220	5.413	5.608	5.806
85		3.525	3.692	3.857	4.027	4.200	4.377	4.554	4.736	4.922	5.111	5.298	5.492	5.689
86		3.452	3.618	3.785	3.955	4.129	4.306	4.489	4.671	4.856	5.046	5.232	5.427	5.624
87		3.380	3.544	3.710	3.880	4.054	4.231	4.412	4.591	4.778	4.969	5.164	5.361	5.559
88		3.310	3.472	3.638	3.808	3.983	4.161	4.342	4.527	4.716	4.909	5.106	5.306	5.507
89		3.240	3.400	3.566	3.736	3.911	4.090	4.273	4.460	4.651	4.846	5.044	5.245	5.448
90		3.170	3.329	3.495	3.665	3.840	4.019	4.202	4.390	4.582	4.778	4.978	5.181	5.386
91		3.100	3.258	3.424	3.594	3.770	3.951	4.136	4.326	4.520	4.718	4.920	5.125	5.332
92		3.030	3.187	3.353	3.523	3.700	3.883	4.070	4.262	4.459	4.660	4.865	5.073	5.283
93		2.960	3.116	3.282	3.452	3.630	3.815	4.005	4.200	4.399	4.602	4.809	5.019	5.231
94		2.890	3.045	3.211	3.381	3.560	3.747	3.940	4.139	4.343	4.551	4.763	4.978	5.194
95		2.820	2.974	3.140	3.310	3.490	3.680	3.880	4.085	4.295	4.510	4.730	4.954	5.180
96		2.750	2.903	3.069	3.239	3.420	3.612	3.815	4.025	4.240	4.460	4.685	4.915	5.150
97		2.680	2.832	2.998	3.168	3.350	3.545	3.750	3.965	4.185	4.410	4.645	4.885	5.130
98		2.610	2.761	2.927	3.097	3.280	3.480	3.690	3.910	4.135	4.370	4.615	4.865	5.120
99		2.540	2.690	2.856	3.026	3.210	3.415	3.630	3.860	4.095	4.340	4.595	4.855	5.120
100		2.470	2.619	2.785	2.955	3.140	3.350	3.570	3.805	4.050	4.305	4.570	4.840	5.110

25	$\frac{a}{a_0}$	5.814	6.076	6.335	6.603	6.869	7.141	7.412	7.690	7.971	8.254	8.536	8.825	9.116
26		5.702	5.957	6.216	6.477	6.740	7.008	7.276	7.551	7.824	8.104	8.387	8.672	8.956
27		5.597	5.845	6.097	6.356	6.618	6.875	7.152	7.416	7.686	7.963	8.239	8.522	8.803
28		5.493	5.738	5.987	6.244	6.499	6.758	7.020	7.285	7.552	7.827	8.100	8.376	8.654
29		5.396	5.635	5.882	6.132	6.385	6.641	6.897	7.159	7.425	7.693	7.964	8.237	8.509
30		5.296	5.536	5.777	6.024	6.271	6.525	6.779	7.039	7.298	7.564	7.829	8.100	8.370
31		5.207	5.442	5.681	5.923	6.168	6.416	6.668	6.922	7.179	7.444	7.707	7.973	8.241
32		5.121	5.350	5.584	5.823	6.063	6.310	6.559	6.812	7.064	7.323	7.601	7.844	8.111
33		5.032	5.263	5.494	5.729	5.967	6.209	6.453	6.704	6.955	7.208	7.464	7.723	7.984
34		4.950	5.176	5.403	5.636	5.872	6.112	6.352	6.598	6.843	7.095	7.350	7.607	7.864
35		4.871	5.096	5.321	5.550	5.779	6.016	6.254	6.496	6.740	6.987	7.237	7.493	7.749
36		4.795	5.015	5.236	5.463	5.690	5.921	6.157	6.398	6.637	6.885	7.128	7.380	7.635
37		4.722	4.938	5.157	5.380	5.606	5.835	6.068	6.303	6.542	6.783	7.028	7.275	7.525
38		4.650	5.865	5.080	5.302	5.524	5.749	5.977	6.212	6.446	6.687	6.927	7.174	7.419
39		4.580	4.794	5.005	5.223	5.444	5.668	5.892	6.123	6.356	6.593	6.829	7.071	7.316
40		4.515	4.724	4.935	5.149	5.366	5.586	5.809	6.036	6.265	6.498	6.733	6.975	7.216
42	4.387	4.592	4.795	5.004	5.217	5.433	5.649	5.871	6.097	6.325	6.552	6.786	7.023	
44	4.270	4.466	4.665	4.870	5.076	5.288	5.500	5.715	5.933	6.157	6.381	6.611	6.840	
46	4.158	4.350	4.546	4.744	4.947	5.152	5.357	5.569	5.783	6.001	6.221	6.445	6.671	
48	4.052	4.240	4.430	4.622	4.818	5.020	5.222	5.431	5.639	5.853	6.067	6.288	6.507	
50	3.953	4.136	4.322	4.512	4.702	4.898	5.097	5.300	5.505	5.713	5.922	6.139	6.351	
52	3.857	4.038	4.219	4.403	4.590	4.783	4.978	5.178	5.377	5.579	5.785	5.996	6.207	
54	3.771	3.943	4.122	4.303	4.485	4.674	4.862	5.056	5.254	5.454	5.653	5.859	6.068	
56	3.686	3.856	4.030	4.207	4.387	4.570	4.756	4.945	5.137	5.332	5.530	5.730	5.933	
58	3.602	3.771	3.940	4.115	4.290	4.471	4.652	4.840	5.027	5.220	5.413	5.608	5.806	
60	3.525	3.692	3.857	4.027	4.200	4.377	4.554	4.736	4.922	5.111	5.298	5.492	5.689	
65	3.352	3.508	3.665	3.828	3.991	4.160	4.329	4.501	4.675	4.856	5.036	5.222	5.407	
70	3.220	3.371	3.525	3.681	3.840	3.996	4.156	4.321	4.491	4.659	4.830	4.979	5.157	
75	3.054	3.198	3.340	3.488	3.636	3.790	3.943	4.102	4.264	4.426	4.590	4.760	4.932	

TABLE 4.- Z-PANEL PROPERTIES $\left[\frac{t_w}{t_s} = 0.79; \frac{b_A}{t_w} = 9.8; \frac{b_F}{b_w} = 0.4; \frac{r_A}{t_w} = 3; \frac{r_F}{t_w} = 4; \frac{d}{t_s} = 1.93; \frac{p}{t_s} = 12.3 \right]$

$\frac{b_w}{t_s}$	$\frac{t_F}{t_s}$	20	21	22	23	24	25	26	27	28	29	30	31	32
25	$\frac{t_F}{t_s}$	1.858	1.893	1.928	1.963	1.998	2.033	2.068	2.103	2.138	2.172	2.207	2.242	2.277
26		1.825	1.859	1.892	1.926	1.959	1.993	2.027	2.060	2.094	2.127	2.161	2.195	2.228
27		1.794	1.827	1.859	1.891	1.924	1.956	1.989	2.021	2.053	2.086	2.118	2.151	2.183
28		1.766	1.797	1.828	1.860	1.891	1.922	1.953	1.984	2.016	2.047	2.078	2.109	2.140
29		1.740	1.770	1.800	1.830	1.860	1.890	1.920	1.950	1.981	2.011	2.041	2.071	2.101
30		1.715	1.744	1.773	1.802	1.831	1.861	1.890	1.919	1.948	1.977	2.006	2.035	2.064
31		1.692	1.720	1.748	1.776	1.805	1.833	1.861	1.889	1.917	1.946	1.974	2.002	2.030
32		1.670	1.698	1.725	1.752	1.779	1.807	1.834	1.861	1.889	1.916	1.943	1.971	1.998
33		1.650	1.676	1.703	1.729	1.756	1.782	1.809	1.835	1.862	1.888	1.915	1.942	1.968
34		1.631	1.657	1.682	1.708	1.734	1.759	1.785	1.811	1.836	1.862	1.888	1.915	1.939
35		1.613	1.638	1.663	1.688	1.713	1.738	1.763	1.788	1.812	1.837	1.862	1.887	1.912
36		1.596	1.620	1.644	1.669	1.693	1.717	1.741	1.766	1.790	1.814	1.838	1.863	1.887
37		1.580	1.603	1.627	1.650	1.674	1.698	1.721	1.745	1.769	1.792	1.816	1.840	1.863
38		1.564	1.587	1.610	1.633	1.656	1.679	1.702	1.725	1.748	1.771	1.794	1.817	1.840
39		1.550	1.572	1.595	1.617	1.640	1.662	1.684	1.707	1.729	1.752	1.774	1.797	1.819
40	$\frac{t_F}{t_s}$	1.536	1.558	1.580	1.602	1.624	1.645	1.667	1.689	1.711	1.733	1.755	1.777	1.798
42		1.511	1.531	1.552	1.573	1.594	1.615	1.635	1.656	1.677	1.698	1.719	1.740	1.760
44		1.487	1.507	1.527	1.547	1.567	1.587	1.607	1.626	1.646	1.666	1.686	1.706	1.726
46		1.466	1.485	1.504	1.523	1.542	1.561	1.580	1.599	1.618	1.637	1.656	1.675	1.694
48		1.447	1.465	1.483	1.501	1.520	1.538	1.556	1.574	1.592	1.611	1.629	1.647	1.665
50		1.429	1.446	1.464	1.481	1.499	1.516	1.534	1.551	1.569	1.586	1.604	1.622	1.639
52		1.412	1.429	1.446	1.463	1.480	1.496	1.513	1.530	1.547	1.564	1.580	1.597	1.614
54		1.397	1.413	1.430	1.446	1.462	1.478	1.494	1.510	1.527	1.543	1.559	1.575	1.591
56	$\frac{t_F}{t_s}$	1.383	1.399	1.414	1.430	1.445	1.461	1.477	1.492	1.508	1.523	1.539	1.555	1.570
58		1.370	1.385	1.400	1.415	1.430	1.445	1.460	1.475	1.490	1.505	1.520	1.535	1.551
60		1.357	1.372	1.387	1.401	1.416	1.430	1.445	1.459	1.474	1.489	1.503	1.518	1.532
65		1.330	1.343	1.357	1.370	1.384	1.397	1.411	1.424	1.438	1.451	1.464	1.478	1.491
70		1.306	1.319	1.331	1.344	1.356	1.369	1.381	1.394	1.406	1.419	1.431	1.444	1.456
75		1.286	1.298	1.309	1.321	1.333	1.344	1.356	1.368	1.379	1.391	1.402	1.414	1.426

25	$\frac{t_F}{t_s}$	4.313	4.395	4.441	5.264	5.595	5.932	6.274	6.622	6.976	7.337	7.700	8.067	8.439
26		4.233	4.314	4.851	5.170	5.497	5.828	6.165	6.510	6.858	7.213	7.571	7.932	8.302
27		4.156	4.237	4.764	5.080	5.399	5.728	6.059	6.399	6.744	7.091	7.447	7.803	8.167
28		4.081	4.164	4.682	4.990	5.307	5.630	5.959	6.294	6.631	6.977	7.327	7.683	8.042
29		4.010	4.091	4.600	4.906	5.218	5.537	5.862	6.192	6.525	6.866	7.211	7.562	7.917
30		3.942	4.023	4.521	4.825	5.133	5.445	5.765	6.091	6.423	6.759	7.101	7.447	7.798
31		3.876	3.957	4.450	4.747	5.048	5.359	5.674	5.997	6.324	6.654	6.992	7.334	7.681
32		3.814	3.892	4.377	4.671	4.971	5.274	5.586	5.905	6.226	6.555	6.889	7.225	7.568
33		3.753	3.833	4.308	4.598	4.892	5.195	5.501	5.815	6.133	6.459	6.786	7.118	7.458
34		3.694	3.772	4.243	4.527	4.817	5.116	5.419	5.727	6.045	6.364	6.688	7.018	7.355
35		3.637	3.715	4.177	4.458	4.745	5.038	5.338	5.644	5.958	6.274	6.596	6.922	7.254
36		3.582	3.660	4.116	4.392	4.676	4.966	5.263	5.563	5.871	6.185	6.504	6.824	7.152
37		3.529	3.608	4.055	4.330	4.609	4.894	5.188	5.485	5.788	6.099	6.412	6.730	7.056
38		3.480	3.557	3.999	4.268	4.545	4.827	5.116	5.411	5.711	6.016	6.327	6.643	6.964
39		3.430	3.507	3.941	4.208	4.479	4.759	5.046	5.335	5.633	5.933	6.242	6.552	6.870
40	$\frac{t_F}{t_s}$	3.383	3.458	3.887	4.149	4.418	4.696	4.977	5.265	5.557	5.855	6.158	6.467	6.784
42		3.291	3.367	3.784	4.039	4.297	4.570	4.848	5.128	5.414	5.706	6.002	6.304	6.614
44		3.207	3.280	3.686	3.935	4.192	4.454	4.722	4.999	5.279	5.565	5.855	6.151	6.451
46		3.126	3.198	3.594	3.838	4.088	4.345	4.608	4.876	5.150	5.430	5.715	6.005	6.299
48		3.050	3.121	3.507	3.746	3.988	4.240	4.497	4.761	5.030	5.301	5.581	5.865	6.155
50		2.979	3.050	3.424	3.658	3.896	4.142	4.392	4.651	4.912	5.182	5.453	5.730	6.015
52		2.912	2.981	3.346	3.574	3.807	4.049	4.295	4.546	4.803	5.065	5.335	5.608	5.885
54		2.848	2.916	3.272	3.495	3.723	3.959	4.201	4.448	4.697	4.955	5.219	5.487	5.760
56	$\frac{t_F}{t_s}$	2.786	2.853	3.203	3.419	3.645	3.875	4.109	4.353	4.599	4.853	5.109	5.371	5.640
58		2.729	2.795	3.136	3.349	3.569	3.794	4.026	4.263	4.505	4.753	5.006	5.261	5.524
60		2.675	2.739	3.072	3.282	3.496	3.718	3.943	4.177	4.414	4.655	4.905	5.157	5.417
65		2.549	2.612	2.927	3.126	3.329	3.541	3.755	3.977	4.203	4.436	4.675	4.915	5.163
70		2.437	2.496	2.797	2.985	3.182	3.381	3.588	3.799	4.017	4.237	4.456	4.696	4.934
75		2.336	2.393	2.680	2.860	3.046	3.239	3.435	3.637	3.847	4.058	4.278	4.500	4.726

25	$\frac{t_F}{t_s}$	5.154	5.932	6.183	6.546	6.908	7.269	7.629	7.988	8.345	8.702	9.133	9.412	9.765
26		5.124	5.957	6.153	6.516	6.877	7.238	7.597	7.957	8.314	8.672	9.027	9.381	9.736
27		5.395	5.921	6.121	6.484	6.845	7.206	7.565	7.925	8.283	8.640	8.996	9.351	9.705
28		5.364	5.885	6.090	6.451	6.813	7.173	7.533	7.892	8.250	8.607	8.964	9.319	9.674
29		5.334	5.849	6.059	6.420	6.781	7.141	7.501	7.860	8.217	8.575	8.931	9.287	9.642
30		5.305	5.815	6.027	6.388	6.749	7.108	7.467	7.826	8.184	8.542	8.898	9.254	9.610
31		5.275	5.780	5.996	6.357	6.715	7.075	7.434	7.793	8.151	8.508	8.865	9.221	9.576
32		5.245	5.745	5.965	6.325	6.684	7.042	7.401	7.760	8.117	8.476	8.832	9.187	9.543
33		5.216	5.711	5.934	6.293	6.651	7.010	7.368	7.726	8.084	8.441	8.797	9.153	9.509
34		5.187	5.677	5.903	6.261	6.618	6.977	7.335	7.692	8.050	8.407	8.763	9.119	9.475
35		5.158	5.644	5.872	6.229	6.587	6.944	7.301	7.658	8.016	8.373	8.729	9.085	9.441
36		5.130	5.611	5.842	6.198	6.555	6.912	7.269	7.625	7.982	8.339	8.696	9.051	9.407
37		5.102	5.579	5.812	6.168	6.524	6.880	7.236	7.592	7.948	8.305	8.661	9.016	9.372
38		5.074	5.547	5.782	6.137	6.492	6.848	7.203	7.559	7.915	8.271	8.627	8.982	9.337
39		5.046	5.515	5.752	6.106	6.460	6.815	7.171	7.526	7.881	8.236	8.592	8.947	9.302
40	$\frac{t_F}{t_s}$	4.998	5.483	5.723	6.075	6.429	6.784	7.138	7.493	7.848	8.203	8.557	8.912	9.268
42		4.965	5.443	5.685	6.036	6.388	6.740	7.094	7.448	7.802	8.155	8.508	8.863	9.218
44		4.913	5.363	5.608	5.957	6.307	6.658	7.009	7.363	7.715	8.068	8.421	8.775	9.128
46		4.861	5.305	5.552	5.899	6.248	6.598	6.948	7.299	7.650	8.002	8.354	8.707	9.060
48		4.811	5.248	5.499	5.843	6.189	6.537	6.886	7.236	7.586	7.			

TABLE 4.- Z-PANEL PROPERTIES - Concluded $\left[\frac{t_w}{t_s} = 0.79; \frac{b_A}{t_w} = 9.8; \frac{b_F}{b_w} = 0.4; \frac{r_A}{t_w} = 3; \frac{r_F}{t_w} = 4; \frac{a}{t_s} = 1.93; \frac{p}{t_s} = 12.3 \right]$

$\frac{b_F}{t_s}$	$\frac{b_w}{t_w}$	33	34	35	36	37	38	39	40	41	42	43	44	45
25		2.312	2.347	2.382	2.417	2.452	2.487	2.522	2.557	2.592	2.627	2.662	2.697	2.732
26		2.262	2.295	2.329	2.363	2.397	2.430	2.464	2.497	2.531	2.564	2.598	2.631	2.665
27		2.216	2.247	2.280	2.312	2.345	2.377	2.410	2.442	2.474	2.506	2.539	2.571	2.604
28		2.171	2.203	2.234	2.265	2.297	2.328	2.359	2.390	2.422	2.453	2.484	2.515	2.546
29		2.131	2.161	2.191	2.222	2.252	2.282	2.312	2.342	2.372	2.402	2.433	2.463	2.493
30		2.093	2.123	2.152	2.181	2.210	2.239	2.268	2.297	2.327	2.356	2.385	2.414	2.443
31		2.058	2.086	2.115	2.143	2.171	2.199	2.228	2.256	2.284	2.312	2.340	2.368	2.397
32		2.026	2.053	2.080	2.107	2.135	2.162	2.189	2.216	2.243	2.271	2.299	2.326	2.353
33		1.995	2.021	2.048	2.074	2.101	2.127	2.153	2.179	2.206	2.232	2.259	2.285	2.312
34		1.965	1.991	2.017	2.042	2.068	2.093	2.119	2.145	2.171	2.196	2.222	2.248	2.274
35	$\frac{t_s}{t_w}$	1.937	1.962	1.987	2.012	2.037	2.062	2.087	2.112	2.137	2.162	2.187	2.212	2.237
36		1.912	1.936	1.960	1.984	2.009	2.033	2.057	2.081	2.106	2.130	2.154	2.178	2.203
37		1.887	1.910	1.934	1.957	1.981	2.005	2.029	2.052	2.076	2.099	2.123	2.146	2.170
38		1.863	1.886	1.909	1.932	1.955	1.978	2.001	2.024	2.047	2.070	2.093	2.116	2.139
39		1.842	1.864	1.886	1.908	1.931	1.953	1.976	1.998	2.021	2.043	2.066	2.088	2.110
40		1.820	1.842	1.864	1.886	1.908	1.929	1.951	1.973	1.995	2.017	2.039	2.060	2.082
42		1.781	1.802	1.823	1.844	1.865	1.885	1.906	1.927	1.948	1.968	1.989	2.010	2.031
44		1.746	1.765	1.785	1.805	1.825	1.845	1.865	1.885	1.905	1.924	1.944	1.964	1.984
46		1.713	1.732	1.751	1.770	1.789	1.808	1.827	1.846	1.865	1.884	1.903	1.922	1.941
48		1.683	1.702	1.720	1.738	1.756	1.774	1.793	1.811	1.829	1.847	1.866	1.884	1.902
50		1.657	1.674	1.692	1.709	1.726	1.743	1.761	1.778	1.796	1.813	1.831	1.848	1.866
52		1.631	1.648	1.665	1.681	1.698	1.715	1.732	1.748	1.765	1.782	1.799	1.816	1.833
54		1.607	1.624	1.640	1.656	1.672	1.688	1.705	1.721	1.737	1.753	1.770	1.786	1.802
56		1.586	1.601	1.617	1.633	1.649	1.664	1.680	1.695	1.711	1.726	1.742	1.757	1.773
58		1.567	1.581	1.596	1.611	1.626	1.641	1.656	1.671	1.686	1.701	1.716	1.731	1.746
60		1.547	1.561	1.576	1.590	1.605	1.620	1.635	1.649	1.664	1.678	1.693	1.707	1.722
65		1.505	1.518	1.532	1.545	1.559	1.572	1.586	1.599	1.613	1.626	1.640	1.653	1.666
70		1.469	1.481	1.494	1.506	1.519	1.531	1.544	1.556	1.569	1.581	1.594	1.606	1.619
75		1.438	1.449	1.461	1.472	1.484	1.496	1.508	1.519	1.531	1.542	1.554	1.566	1.578
25		8.815	9.195	9.578	9.965	10.36	10.75	11.15	11.55	11.95	12.35	12.75	13.17	13.59
26		8.672	9.050	9.448	9.809	10.19	10.59	10.98	11.38	11.77	12.18	12.58	12.99	13.40
27		8.532	8.909	9.282	9.662	10.04	10.43	10.82	11.21	11.61	12.01	12.40	12.81	13.21
28		8.406	8.770	9.142	9.518	9.893	10.28	10.66	11.05	11.44	11.84	12.23	12.63	13.04
29		8.277	8.641	9.008	9.376	9.751	10.13	10.51	10.90	11.29	11.68	12.07	12.46	12.86
30		8.154	8.510	8.873	9.241	9.612	9.987	10.37	10.75	11.13	11.52	11.91	12.30	12.70
31		8.033	8.389	8.745	9.109	9.477	9.848	10.22	10.60	10.98	11.36	11.75	12.14	12.53
32		7.913	8.265	8.622	8.983	9.343	9.711	10.08	10.46	10.84	11.21	11.59	11.98	12.37
33		7.800	8.149	8.499	8.856	9.213	9.579	9.948	10.32	10.69	11.07	11.45	11.83	12.22
34		7.694	8.036	8.383	8.738	9.092	9.455	9.817	10.18	10.55	10.93	11.30	11.68	12.06
35	$\frac{t_s}{t_w}$	7.589	7.929	8.274	8.622	8.974	9.330	9.690	10.05	10.42	10.79	11.16	11.54	11.92
36		7.482	7.819	8.161	8.507	8.853	9.207	9.564	9.926	10.29	10.65	11.02	11.40	11.77
37		7.383	7.719	8.055	8.399	8.742	9.090	9.441	9.800	10.16	10.52	10.89	11.26	11.63
38		7.289	7.619	7.953	8.291	8.633	8.979	9.328	9.681	10.04	10.40	10.76	11.13	11.50
39		7.190	7.518	7.850	8.186	8.522	8.867	9.210	9.562	9.913	10.27	10.63	10.99	11.36
40		7.102	7.424	7.751	8.081	8.416	8.759	9.102	9.448	9.797	10.15	10.51	10.87	11.23
42		6.925	7.241	7.561	7.885	8.214	8.549	8.885	9.225	9.568	9.919	10.27	10.62	10.98
44		6.756	7.070	7.384	7.702	8.034	8.350	8.680	9.014	9.351	9.697	10.04	10.39	10.74
46		6.599	6.903	7.212	7.524	7.841	8.162	8.487	8.815	9.148	9.483	9.823	10.17	10.51
48		6.449	6.745	7.048	7.356	7.668	7.984	8.300	8.623	8.951	9.282	9.612	9.950	10.29
50		6.301	6.595	6.890	7.193	7.501	7.812	8.124	8.443	8.762	9.089	9.414	9.748	10.08
52		6.167	6.453	6.744	7.043	7.342	7.646	7.953	8.269	8.584	8.902	9.224	9.549	9.878
54		6.038	6.317	6.604	6.896	7.192	7.491	7.791	8.098	8.410	8.725	9.038	9.360	9.686
56		5.911	6.186	6.450	6.754	7.042	7.339	7.635	7.939	8.243	8.555	8.866	9.185	9.503
58		5.788	6.063	6.340	6.621	6.906	7.196	7.489	7.786	8.087	8.392	8.700	9.012	9.327
60		5.678	5.947	6.217	6.495	6.774	7.056	7.320	7.591	7.907	8.233	8.534	8.844	9.151
65		5.413	5.670	5.929	6.195	6.462	6.737	7.011	7.294	7.576	7.863	8.156	8.453	8.754
70		5.174	5.421	5.669	5.925	6.182	6.446	6.711	6.983	7.255	7.535	7.814	8.101	8.387
75		4.956	5.194	5.434	5.681	5.928	6.180	6.435	6.698	6.961	7.232	7.502	7.776	8.052
25		10.12	10.47	10.82	11.17	11.51	11.86	12.21	12.55	12.89	13.23	13.57	13.91	14.25
26		10.19	10.44	10.79	11.14	11.49	11.83	12.18	12.53	12.87	13.21	13.56	13.90	14.24
27		10.06	10.41	10.76	11.11	11.46	11.81	12.16	12.50	12.85	13.19	13.53	13.88	14.22
28		10.03	10.38	10.73	11.08	11.43	11.78	12.13	12.48	12.82	13.17	13.51	13.85	14.20
29		9.996	10.35	10.70	11.05	11.40	11.75	12.10	12.45	12.80	13.14	13.49	13.83	14.17
30		9.964	10.32	10.67	11.02	11.37	11.72	12.07	12.42	12.77	13.11	13.46	13.81	14.15
31		9.931	10.29	10.64	10.99	11.34	11.69	12.04	12.39	12.74	13.09	13.43	13.78	14.12
32		9.897	10.25	10.61	10.96	11.31	11.66	12.01	12.36	12.71	13.06	13.40	13.75	14.10
33		9.864	10.22	10.57	10.93	11.27	11.63	11.98	12.33	12.68	13.03	13.38	13.72	14.07
34		9.830	10.18	10.54	10.89	11.24	11.60	11.95	12.30	12.65	13.00	13.35	13.69	14.04
35	$\frac{t_s}{t_w}$	9.796	10.15	10.50	10.86	11.21	11.56	11.92	12.27	12.62	12.97	13.31	13.66	14.01
36		9.761	10.12	10.47	10.82	11.18	11.53	11.88	12.23	12.58	12.93	13.28	13.63	13.98
37		9.727	10.08	10.44	10.79	11.14	11.50	11.85	12.20	12.55	12.90	13.25	13.60	13.95
38		9.693	10.05	10.40	10.76	11.11	11.46	11.81	12.17	12.52	12.87	13.21	13.57	13.92
39		9.657	10.01	10.37	10.72	11.07	11.43	11.78	12.13	12.48	12.84	13.19	13.54	13.89
40		9.623	9.977	10.33	10.69	11.04	11.39	11.75	12.10	12.45	12.80	13.15	13.50	13.85
42		9.553	9.907	10.26	10.61	10.97	11.32	11.68	12.03	12.38	12.73	13.08	13.43	13.79
44		9.482	9.837	10.19	10.54	10.89	11.25	11.60	11.96	12.32	12.66	13.01	13.36	13.72
46		9.414	9.767	10.12	10.47	10.83	11.18	11.53	11.89	12.24	12.59	12.94	13.30	13.65
48		9.345	9.697	10.10	10.40	10.76	11.11	11.46	11.81	12.17	12.52	12.87	13.22	13.58
50		9.275	9.627	9.979	10.33	10.69	11.04	11.39	11.74	12.10	12.45	12.80	13.15	13.50
52		9.208	9.559	9.911	10.26	10.61	10.97	11.32	11.67	12.02	12.38	12.73	13.08	13.43
54		9.142	9.491	9.841	10.19	10.54	10.90	11.25	11.60	11.95	12.30	12.65	13.01	13.36
56		9.075	9.410	9.766	10.12	10								

TABLE 5.- Z-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 1.00; \frac{b_A}{t_W} = 8.6; \frac{b_F}{t_W} = 0.4; \frac{r_A}{t_W} = 3; \frac{r_F}{t_W} = 4; \frac{d}{t_S} = 1.95; \frac{p}{t_S} = 11.7 \right]$

$\frac{b_F}{t_S}$	$\frac{t_W}{t_S}$	20	21	22	23	24	25	26	27	28	29	30	31	32
25		2.327	2.383	2.439	2.495	2.551	2.607	2.663	2.719	2.775	2.831	2.887	2.943	2.999
26		2.276	2.330	2.383	2.437	2.491	2.545	2.599	2.653	2.706	2.760	2.814	2.868	2.922
27		2.228	2.280	2.332	2.384	2.436	2.488	2.540	2.591	2.643	2.695	2.747	2.799	2.851
28		2.185	2.235	2.285	2.335	2.385	2.435	2.485	2.535	2.585	2.635	2.685	2.735	2.785
29		2.144	2.192	2.240	2.289	2.337	2.385	2.433	2.482	2.530	2.578	2.626	2.675	2.723
30		2.106	2.152	2.198	2.246	2.292	2.339	2.386	2.432	2.479	2.526	2.572	2.619	2.666
31		2.070	2.115	2.160	2.205	2.251	2.296	2.341	2.386	2.432	2.476	2.522	2.567	2.612
32		2.036	2.080	2.124	2.168	2.211	2.255	2.299	2.343	2.386	2.430	2.474	2.517	2.561
33		2.005	2.048	2.090	2.132	2.175	2.217	2.260	2.302	2.344	2.387	2.429	2.472	2.514
34		1.975	2.017	2.053	2.099	2.140	2.181	2.223	2.264	2.305	2.346	2.387	2.429	2.470
35		1.948	1.988	2.023	2.068	2.108	2.148	2.188	2.228	2.268	2.308	2.348	2.388	2.428
36		1.921	1.960	1.999	2.038	2.077	2.116	2.155	2.194	2.232	2.271	2.310	2.349	2.388
37		1.896	1.934	1.972	2.010	2.048	2.086	2.123	2.161	2.199	2.237	2.275	2.313	2.350
38		1.873	1.910	1.946	1.983	2.020	2.057	2.094	2.131	2.168	2.204	2.241	2.278	2.315
39		1.850	1.886	1.922	1.958	1.994	2.030	2.066	2.102	2.138	2.174	2.209	2.245	2.281
40		1.829	1.864	1.899	1.934	1.969	2.004	2.039	2.074	2.109	2.144	2.179	2.214	2.249
42		1.790	1.823	1.856	1.890	1.923	1.956	1.990	2.023	2.056	2.090	2.123	2.157	2.190
44		1.754	1.786	1.817	1.849	1.881	1.913	1.945	1.976	2.008	2.040	2.072	2.104	2.136
46		1.721	1.751	1.781	1.812	1.843	1.873	1.904	1.934	1.964	1.995	2.025	2.056	2.086
48		1.691	1.720	1.749	1.778	1.808	1.837	1.866	1.895	1.924	1.953	1.983	2.012	2.041
50		1.663	1.691	1.719	1.747	1.775	1.803	1.831	1.859	1.887	1.915	1.943	1.971	1.999
52		1.638	1.665	1.692	1.719	1.746	1.772	1.799	1.826	1.853	1.880	1.907	1.934	1.961
54		1.614	1.640	1.666	1.692	1.718	1.744	1.770	1.796	1.822	1.848	1.873	1.899	1.925
56		1.592	1.617	1.642	1.667	1.692	1.717	1.742	1.767	1.792	1.817	1.842	1.867	1.892
58		1.572	1.596	1.620	1.644	1.668	1.693	1.717	1.741	1.765	1.789	1.813	1.837	1.861
60		1.553	1.576	1.599	1.623	1.646	1.669	1.693	1.716	1.739	1.763	1.786	1.810	1.833
65		1.510	1.532	1.553	1.575	1.596	1.618	1.639	1.661	1.683	1.704	1.726	1.748	1.769
70		1.474	1.494	1.514	1.534	1.554	1.574	1.594	1.614	1.634	1.654	1.674	1.694	1.714
75		1.442	1.461	1.480	1.499	1.517	1.536	1.554	1.573	1.592	1.610	1.629	1.648	1.666
25		6.576	7.011	7.519	8.003	8.493	8.990	9.493	10.00	10.52	11.03	11.56	12.09	12.62
26		6.473	6.935	7.408	7.886	8.371	8.862	9.360	9.863	10.38	10.89	11.41	11.93	12.46
27		6.376	6.833	7.298	7.770	8.250	8.737	9.230	9.732	10.24	10.75	11.26	11.78	12.30
28		6.278	6.729	7.190	7.658	8.133	8.615	9.104	9.599	10.10	10.61	11.12	11.63	12.15
29		6.185	6.633	7.089	7.550	8.021	8.500	8.985	9.473	9.970	10.47	10.98	11.49	12.01
30		6.095	6.539	6.988	7.445	7.911	8.385	8.861	9.352	9.843	10.34	10.84	11.35	11.86
31		6.008	6.446	6.892	7.346	7.805	8.274	8.750	9.232	9.716	10.21	10.71	11.21	11.72
32		5.926	6.357	6.797	7.246	7.705	8.168	8.638	9.114	9.600	10.09	10.58	11.08	11.59
33		5.842	6.268	6.706	7.152	7.602	8.063	8.527	9.003	9.483	9.965	10.46	10.95	11.45
34		5.764	6.185	6.617	7.057	7.506	7.962	8.421	8.890	9.366	9.848	10.33	10.82	11.32
35		5.684	6.103	6.530	6.966	7.409	7.860	8.313	8.782	9.253	9.730	10.21	10.70	11.19
36		5.611	6.025	6.448	6.879	7.317	7.764	8.217	8.677	9.147	9.620	10.10	10.58	11.07
37		5.539	5.948	6.366	6.793	7.227	7.669	8.122	8.578	9.040	9.508	9.982	10.46	10.95
38		5.466	5.871	6.288	6.711	7.141	7.579	8.024	8.476	8.934	9.402	9.873	10.35	10.83
39		5.393	5.800	6.210	6.628	7.055	7.489	7.930	8.378	8.833	9.294	9.765	10.24	10.71
40		5.332	5.729	6.135	6.549	6.972	7.403	7.840	8.285	8.736	9.194	9.657	10.13	10.60
42		5.202	5.592	5.991	6.395	6.811	7.235	7.663	8.101	8.547	8.994	9.451	9.910	10.38
44		5.080	5.461	5.854	6.252	6.659	7.074	7.500	7.929	8.364	8.807	9.255	9.709	10.17
46		4.965	5.340	5.721	6.115	6.513	6.922	7.335	7.760	8.191	8.625	9.069	9.514	9.970
48		4.855	5.222	5.593	5.984	6.374	6.775	7.184	7.600	8.024	8.454	8.885	9.328	9.775
50		4.751	5.111	5.480	5.858	6.241	6.638	7.040	7.449	7.864	8.287	8.716	9.151	9.592
52		4.650	5.003	5.365	5.735	6.114	6.505	6.900	7.302	7.711	8.127	8.549	8.977	9.411
54		4.556	4.902	5.253	5.622	5.995	6.375	6.764	7.159	7.562	7.971	8.392	8.814	9.242
56		4.465	4.805	5.155	5.513	5.880	6.255	6.637	7.027	7.424	7.828	8.238	8.654	9.077
58		4.377	4.711	5.055	5.408	5.769	6.135	6.513	6.896	7.287	7.686	8.090	8.502	8.919
60		4.293	4.623	4.961	5.306	5.662	6.026	6.394	6.773	7.159	7.548	7.943	8.350	8.762
65		4.101	4.415	4.740	5.071	5.414	5.761	6.120	6.483	6.851	7.232	7.614	8.003	8.403
70		3.926	4.228	4.539	4.858	5.186	5.522	5.865	6.217	6.575	6.940	7.311	7.689	8.074
75		3.768	4.058	4.356	4.665	4.930	5.303	5.637	5.974	6.319	6.675	7.033	7.397	7.773
25		7.258	7.720	8.178	8.634	9.086	9.535	9.982	10.43	10.87	11.31	11.74	12.18	12.61
26		7.239	7.701	8.161	8.616	9.069	9.519	9.967	10.41	10.85	11.29	11.73	12.17	12.60
27		7.219	7.682	8.141	8.598	9.051	9.502	9.950	10.40	10.84	11.28	11.72	12.16	12.59
28		7.199	7.661	8.121	8.578	9.032	9.484	9.933	10.38	10.82	11.27	11.71	12.14	12.58
29		7.178	7.641	8.101	8.558	9.013	9.465	9.915	10.36	10.80	11.25	11.69	12.13	12.57
30		7.156	7.619	8.079	8.537	8.992	9.445	9.896	10.34	10.79	11.23	11.68	12.12	12.55
31		7.134	7.597	8.058	8.516	8.971	9.423	9.876	10.33	10.77	11.22	11.66	12.10	12.54
32		7.111	7.574	8.035	8.493	8.949	9.404	9.855	10.30	10.75	11.20	11.64	12.08	12.52
33		7.088	7.551	8.012	8.471	8.926	9.381	9.833	10.28	10.73	11.18	11.62	12.07	12.51
34		7.066	7.527	7.989	8.447	8.904	9.359	9.811	10.26	10.71	11.16	11.60	12.05	12.49
35		7.041	7.504	7.965	8.423	8.880	9.335	9.788	10.24	10.69	11.14	11.58	12.03	12.47
36		7.019	7.480	7.941	8.400	8.856	9.311	9.765	10.22	10.67	11.12	11.56	12.01	12.45
37		6.994	7.457	7.917	8.375	8.832	9.287	9.742	10.19	10.64	11.09	11.54	11.99	12.43
38		6.970	7.432	7.893	8.351	8.807	9.263	9.717	10.17	10.62	11.07	11.52	11.96	12.41
39		6.946	7.408	7.868	8.326	8.782	9.238	9.692	10.15	10.60	11.05	11.49	11.94	12.39
40		6.922	7.383	7.843	8.301	8.758	9.214	9.668	10.12	10.57	11.02	11.47	11.92	12.36
42		6.872	7.334	7.793	8.250	8.707	9.163	9.617	10.07	10.52	10.97	11.42	11.87	12.32
44		6.825	7.284	7.743	8.200	8.656	9.111	9.565	10.02	10.47	10.92	11.37	11.82	12.27
46		6.777	7.235	7.692	8.149	8.604	9.057	9.511	9.967	10.42	10.87	11.32	11.77	12.22
48		6.723	7.185	7.642	8.098	8.552	9.006	9.461	9.916	10.37	10.82	11.27	11.72	12.17
50		6.681	7.136	7.592	8.046	8.501	8.954	9.408	9.861	10.31	10.77	11.22	11.67	12.12
52		6.633	7.087	7.541	7.994	8.448	8.902	9.355	9.808	10.26	10.71	11.16	11.61	12.06
54		6.586	7.039	7.491	7.943	8.396	8.849	9.301	9.754	10.21	10.66	11.11	11.56	12.01
56		6.540	6.991	7.442	7.894	8.345	8.797	9.249	9.701	10.15	10.60	11.05	11.50	11.95
58		6.493	6.943											

TABLE 5.- Z-PANEL PROPERTIES - Concluded $\left[\frac{t_W}{t_S} = 1.00; \frac{b_A}{t_W} = 8.6; \frac{b_F}{b_W} = 0.4; \frac{r_A}{t_W} = 3; \frac{r_F}{t_W} = 4; \frac{d}{t_S} = 1.95; \frac{p}{t_S} = 11.7 \right]$

$\frac{b_W}{t_S}$	$\frac{b_F}{t_W}$	33	34	35	36	37	38	39	40	41	42	43	44	45
25		3.055	3.111	3.167	3.223	3.279	3.335	3.391	3.447	3.503	3.559	3.615	3.671	3.727
26		2.976	3.030	3.084	3.137	3.191	3.245	3.299	3.353	3.407	3.460	3.514	3.568	3.622
27		2.903	2.954	3.006	3.058	3.110	3.162	3.214	3.265	3.317	3.369	3.421	3.473	3.525
28		2.835	2.885	2.935	2.985	3.035	3.085	3.135	3.185	3.235	3.285	3.335	3.385	3.435
29		2.773	2.820	2.868	2.916	2.965	3.013	3.061	3.109	3.158	3.206	3.254	3.302	3.351
30		2.713	2.759	2.806	2.852	2.899	2.946	2.993	3.039	3.086	3.132	3.179	3.226	3.273
31		2.656	2.702	2.747	2.792	2.838	2.883	2.928	2.973	3.018	3.063	3.109	3.154	3.199
32		2.604	2.649	2.693	2.736	2.780	2.824	2.868	2.911	2.955	2.999	3.043	3.086	3.130
33		2.557	2.599	2.642	2.684	2.727	2.769	2.811	2.854	2.896	2.938	2.981	3.023	3.066
34		2.512	2.552	2.593	2.634	2.676	2.717	2.759	2.799	2.840	2.881	2.923	2.964	3.005
35		2.468	2.508	2.548	2.588	2.628	2.668	2.708	2.748	2.788	2.828	2.868	2.908	2.948
36		2.427	2.466	2.505	2.544	2.583	2.621	2.660	2.699	2.738	2.777	2.816	2.855	2.894
37		2.388	2.426	2.464	2.502	2.540	2.578	2.616	2.653	2.691	2.729	2.767	2.805	2.843
38		2.352	2.389	2.426	2.462	2.499	2.536	2.573	2.610	2.647	2.683	2.720	2.757	2.794
39		2.317	2.353	2.389	2.425	2.461	2.497	2.533	2.568	2.604	2.640	2.676	2.712	2.748
40		2.284	2.319	2.354	2.389	2.424	2.459	2.494	2.529	2.564	2.599	2.634	2.669	2.704
42		2.224	2.256	2.290	2.323	2.357	2.390	2.423	2.456	2.490	2.523	2.557	2.590	2.623
44		2.168	2.199	2.231	2.263	2.295	2.327	2.359	2.390	2.422	2.454	2.486	2.517	2.549
46		2.117	2.147	2.178	2.208	2.239	2.269	2.300	2.330	2.361	2.391	2.421	2.451	2.482
48		2.070	2.099	2.129	2.158	2.187	2.216	2.245	2.274	2.304	2.333	2.362	2.391	2.420
50		2.027	2.055	2.083	2.111	2.139	2.167	2.195	2.223	2.251	2.279	2.307	2.335	2.362
52		1.988	2.015	2.042	2.069	2.096	2.122	2.149	2.176	2.203	2.230	2.257	2.284	2.311
54		1.951	1.977	2.003	2.029	2.055	2.081	2.107	2.133	2.160	2.185	2.211	2.236	2.262
56		1.917	1.942	1.967	1.992	2.017	2.042	2.067	2.092	2.117	2.142	2.168	2.192	2.217
58		1.885	1.910	1.934	1.958	1.982	2.006	2.031	2.055	2.079	2.103	2.127	2.151	2.175
60		1.857	1.879	1.903	1.926	1.950	1.973	1.997	2.020	2.043	2.066	2.090	2.113	2.137
65		1.791	1.812	1.834	1.855	1.877	1.898	1.920	1.941	1.963	1.984	2.006	2.027	2.049
70		1.734	1.754	1.774	1.794	1.814	1.834	1.854	1.874	1.894	1.914	1.934	1.954	1.974
75		1.685	1.704	1.723	1.741	1.758	1.778	1.796	1.816	1.835	1.853	1.872	1.890	1.909
25		13.16	13.70	14.24	14.79	15.34	15.89	16.45	17.01	17.57	18.14	18.71	19.28	19.85
26		12.99	13.53	14.07	14.62	15.16	15.71	16.27	16.82	17.38	17.95	18.51	19.07	19.64
27		12.83	13.37	13.91	14.44	14.99	15.53	16.08	16.64	17.20	17.75	18.31	18.88	19.44
28		12.68	13.21	13.74	14.28	14.82	15.36	15.91	16.45	17.01	17.56	18.12	18.68	19.24
29		12.52	13.05	13.58	14.12	14.65	15.19	15.73	16.28	16.77	17.33	17.94	18.49	19.05
30		12.38	12.90	13.42	13.96	14.49	15.02	15.56	16.11	16.65	17.20	17.75	18.30	18.86
31		12.24	12.75	13.28	13.80	14.35	14.86	15.40	15.94	16.48	17.03	17.57	18.12	18.68
32		12.10	12.61	13.13	13.65	14.18	14.70	15.23	15.77	16.31	16.85	17.40	17.95	18.50
33		11.96	12.47	12.98	13.50	14.02	14.55	15.08	15.61	16.15	16.69	17.23	17.77	18.32
34		11.82	12.33	12.84	13.36	13.87	14.39	14.92	15.45	15.98	16.52	17.06	17.60	18.14
35		11.69	12.19	12.70	13.21	13.73	14.24	14.77	15.29	15.82	16.36	16.89	17.43	17.97
36		11.56	12.06	12.56	13.07	13.58	14.10	14.62	15.14	15.67	16.20	16.73	17.27	17.80
37		11.44	11.94	12.43	12.94	13.44	13.96	14.47	15.00	15.52	16.04	16.57	17.10	17.64
38		11.32	11.81	12.30	12.81	13.31	13.82	14.33	14.85	15.39	15.89	16.42	16.95	17.48
39		11.20	11.69	12.18	12.67	13.18	13.68	14.19	14.71	15.22	15.74	16.27	16.79	17.32
40		11.08	11.57	12.05	12.55	13.05	13.55	14.06	14.57	15.08	15.60	16.12	16.64	17.17
42		10.85	11.33	11.81	12.30	12.79	13.29	13.79	14.29	14.80	15.31	15.82	16.34	16.86
44		10.63	11.11	11.58	12.06	12.55	13.04	13.53	14.03	14.53	15.03	15.54	16.06	16.57
46		10.43	10.90	11.36	11.84	12.31	12.80	13.28	13.78	14.27	14.77	15.27	15.78	16.29
48		10.23	10.69	11.15	11.62	12.09	12.57	13.05	13.54	14.02	14.51	15.01	15.51	16.02
50		10.04	10.49	10.95	11.41	11.87	12.35	12.82	13.30	13.78	14.27	14.76	15.26	15.79
52		9.851	10.30	10.75	11.20	11.66	12.13	12.60	13.07	13.55	14.03	14.52	15.01	15.50
54		9.675	10.11	10.56	11.01	11.46	11.92	12.39	12.85	13.32	13.80	14.28	14.77	15.26
56		9.505	9.938	10.38	10.82	11.27	11.72	12.18	12.65	13.11	13.58	14.05	14.54	15.02
58		9.342	9.766	10.20	10.64	11.08	11.53	11.98	12.44	12.90	13.37	13.84	14.31	14.79
60		9.176	9.605	10.03	10.46	10.90	11.34	11.79	12.23	12.70	13.16	13.62	14.09	14.56
65		8.803	9.215	9.627	10.05	10.47	10.90	11.34	11.78	12.22	12.67	13.12	13.58	14.00
70		8.464	8.860	9.261	9.668	10.08	10.50	10.92	11.35	11.78	12.21	12.65	13.10	13.55
75		8.149	8.531	8.919	9.318	9.727	10.13	10.54	10.95	11.36	11.79	12.22	12.66	13.09
25		13.04	13.46	13.89	14.31	14.73	15.15	15.57	15.99	16.40	16.81	17.22	17.63	18.04
26		13.03	13.46	13.89	14.31	14.73	15.15	15.57	15.99	16.41	16.82	17.23	17.64	18.05
27		13.02	13.45	13.88	14.31	14.73	15.15	15.57	15.99	16.41	16.83	17.24	17.65	18.06
28		13.01	13.45	13.87	14.30	14.73	15.15	15.57	15.99	16.41	16.83	17.25	17.66	18.07
29		13.00	13.44	13.87	14.30	14.72	15.15	15.57	15.99	16.41	16.83	17.25	17.66	18.08
30		12.99	13.42	13.86	14.29	14.71	15.14	15.57	15.99	16.41	16.83	17.25	17.67	18.08
31		12.98	13.41	13.85	14.28	14.71	15.13	15.56	15.98	16.41	16.83	17.25	17.67	18.08
32		12.96	13.40	13.83	14.27	14.70	15.12	15.55	15.98	16.40	16.82	17.25	17.67	18.08
33		12.95	13.38	13.82	14.25	14.68	15.11	15.54	15.97	16.40	16.82	17.24	17.66	18.08
34		12.93	13.37	13.80	14.24	14.67	15.10	15.53	15.96	16.39	16.81	17.24	17.66	18.08
35		12.91	13.35	13.79	14.22	14.66	15.09	15.52	15.95	16.38	16.80	17.23	17.65	18.07
36		12.89	13.33	13.77	14.21	14.64	15.08	15.51	15.94	16.37	16.80	17.22	17.64	18.07
37		12.87	13.31	13.75	14.19	14.63	15.06	15.49	15.92	16.35	16.78	17.21	17.63	18.06
38		12.85	13.29	13.73	14.17	14.61	15.04	15.48	15.91	16.34	16.77	17.20	17.62	18.05
39		12.83	13.27	13.71	14.15	14.59	15.03	15.46	15.89	16.33	16.76	17.19	17.61	18.04
40		12.81	13.25	13.69	14.13	14.57	15.01	15.44	15.88	16.31	16.74	17.17	17.60	18.03
42		12.76	13.21	13.65	14.09	14.53	14.97	15.41	15.84	16.28	16.71	17.14	17.57	18.00
44		12.71	13.16	13.60	14.05	14.49	14.93	15.37	15.80	16.24	16.67	17.11	17.54	17.97
46		12.67	13.11	13.56	14.00	14.44	14.88	15.32	15.76	16.20	16.64	17.07	17.51	17.92
48		12.62	13.06	13.51	13.95	14.39	14.84	15.28	15.72	16.16	16.59	17.03	17.47	17.90
50		12.56	13.01	13.46	13.90	14.35	14.79	15.23	15.67	16.11	16.55	16.99	17.42	17.87
52		12.51	12.96	13.40	13.85	14.30	14.74	15.18	15.62	16.07	16.51	16.94	17.38	17.82
54		12.46	12.90	13.35	13.80	14.24	14.69	15.13	15.57	16.02	16.46	16.90	17.34	17.78
56		12.40	12.85	13.30	13.75	14.19	14.64	15.08	15.52					

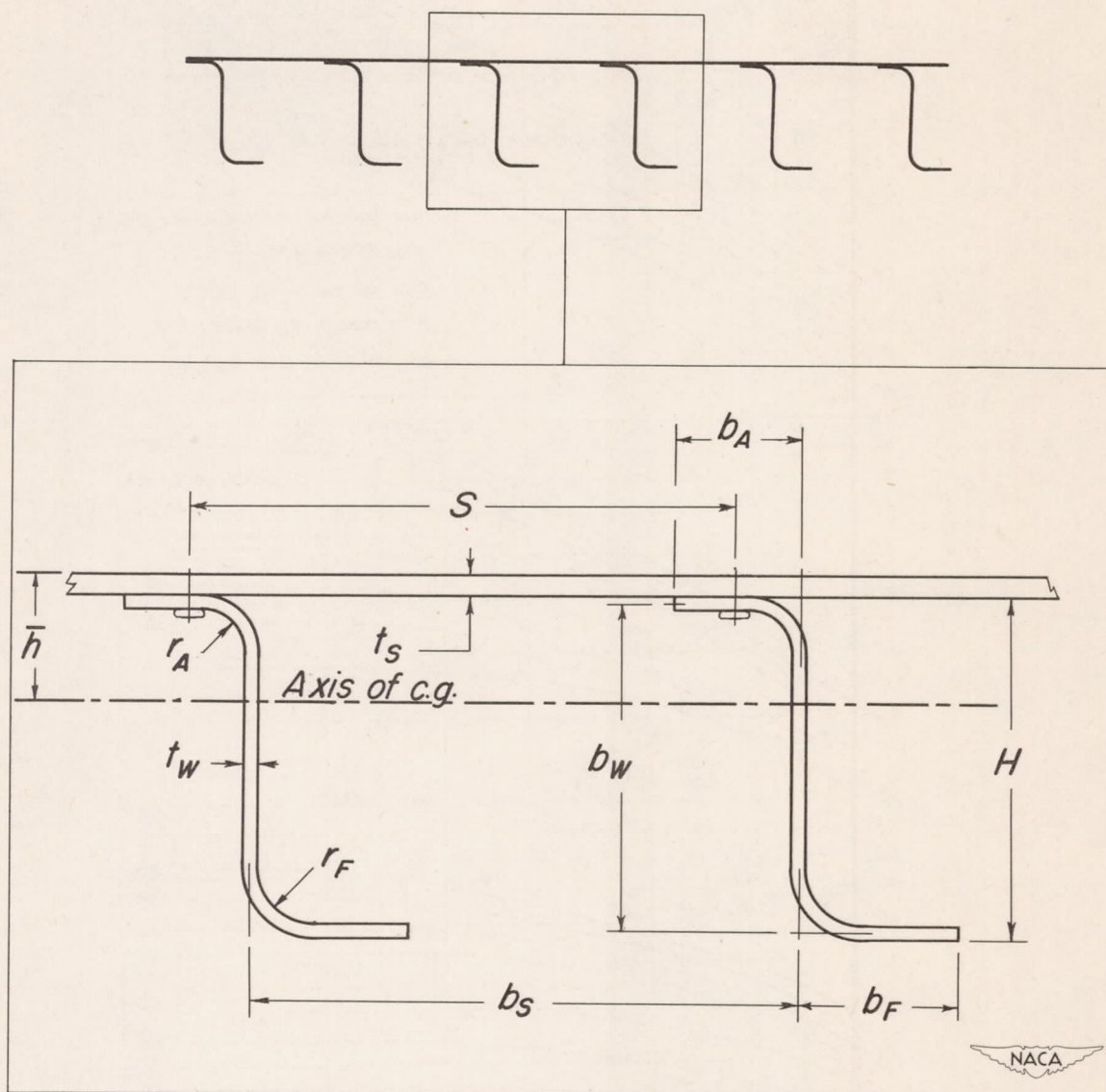


Figure 1. - Symbols for panel dimensions.

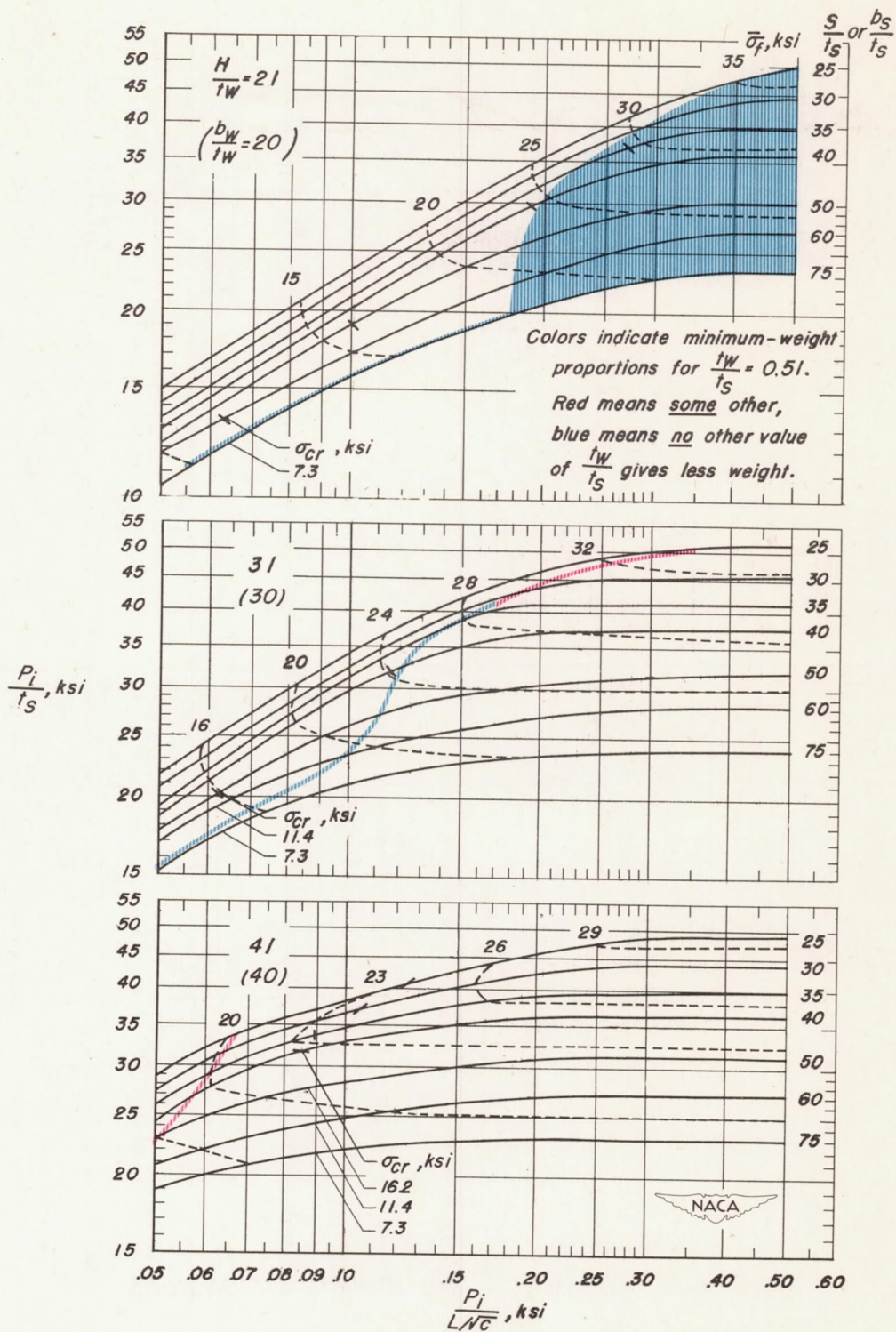
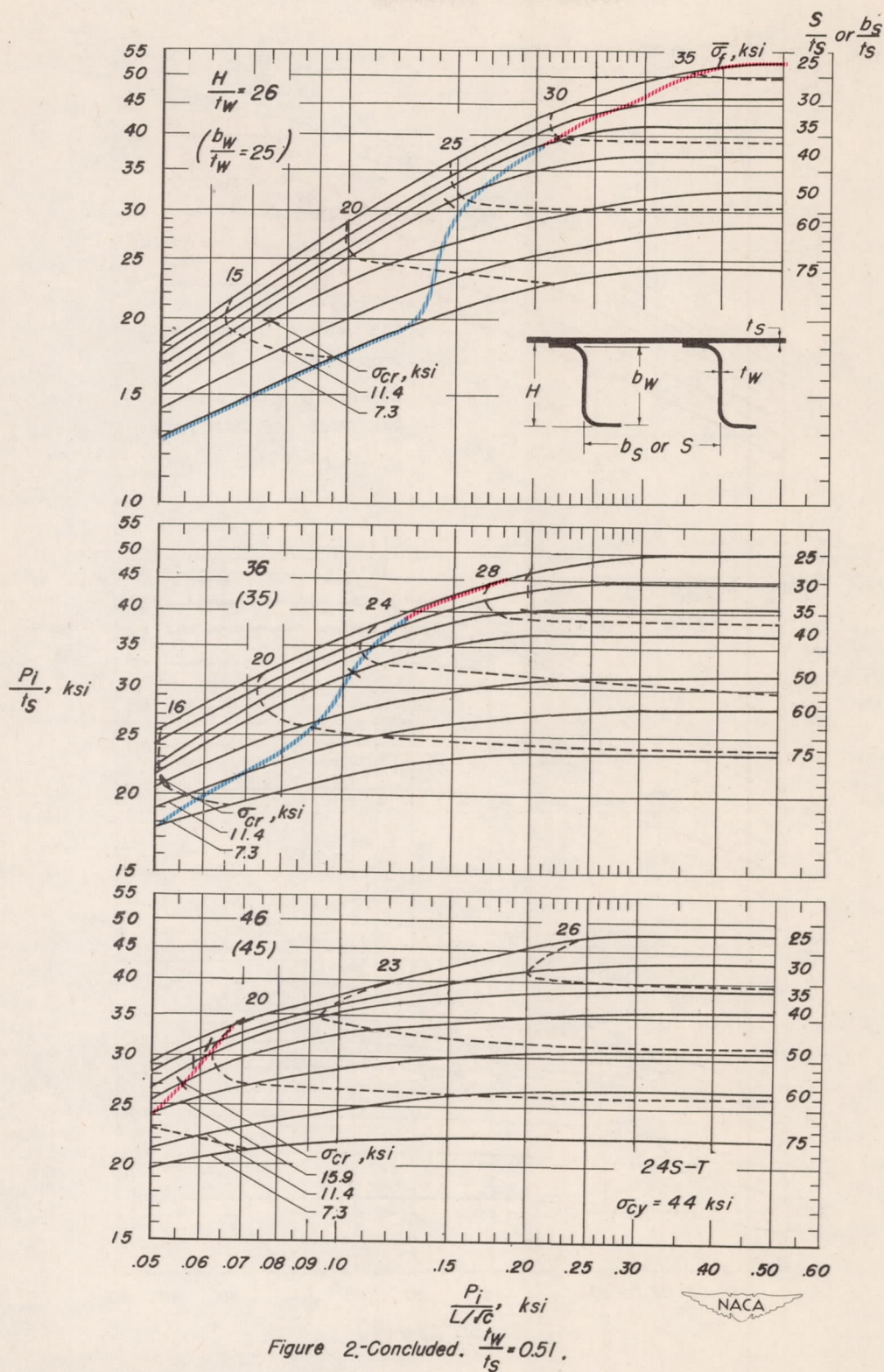


Figure 2. Direct-reading design charts for 24S-T aluminum-alloy Z-stiffened panels, $\frac{t_W}{t_s} = 0.51$.



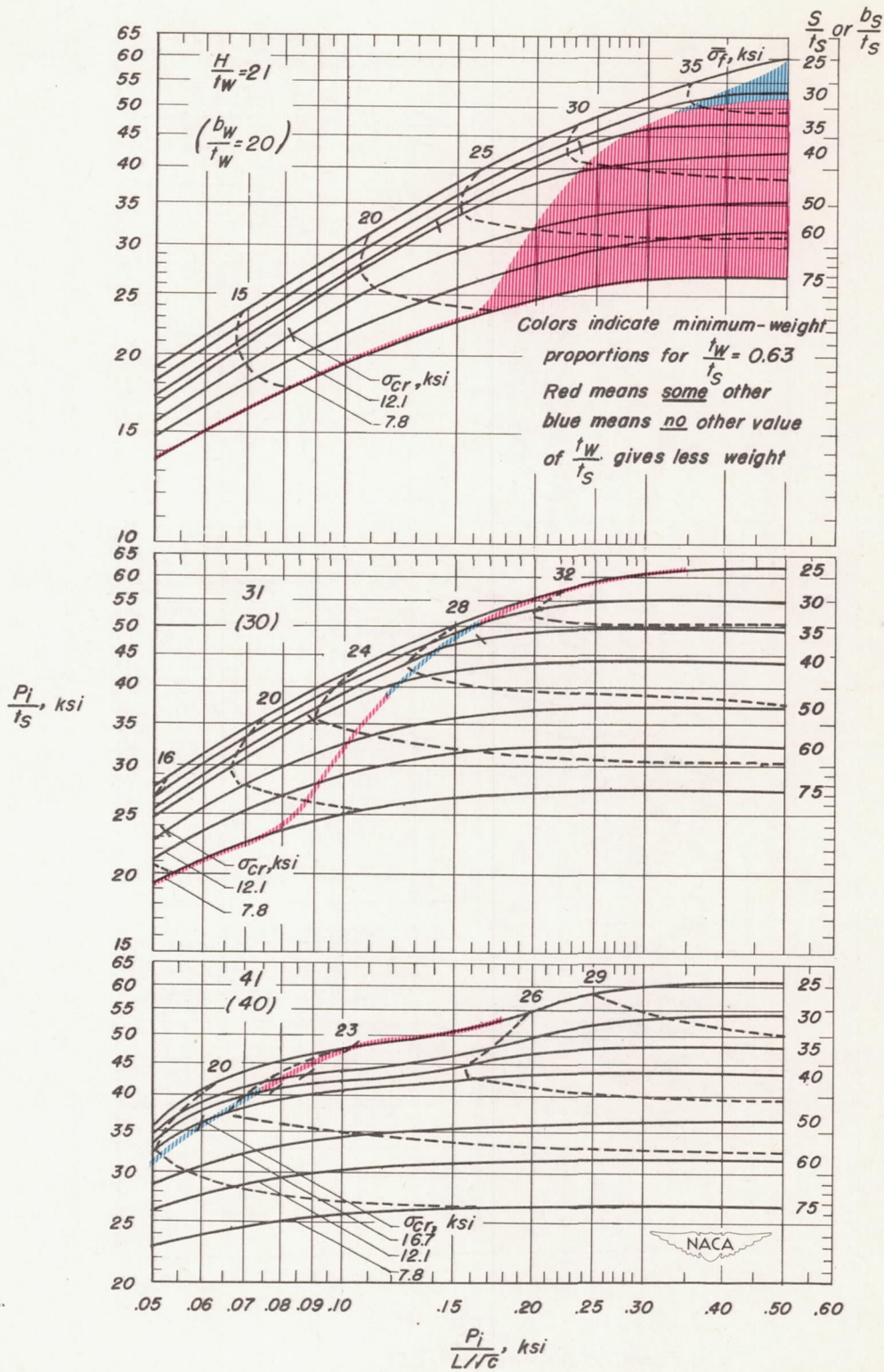
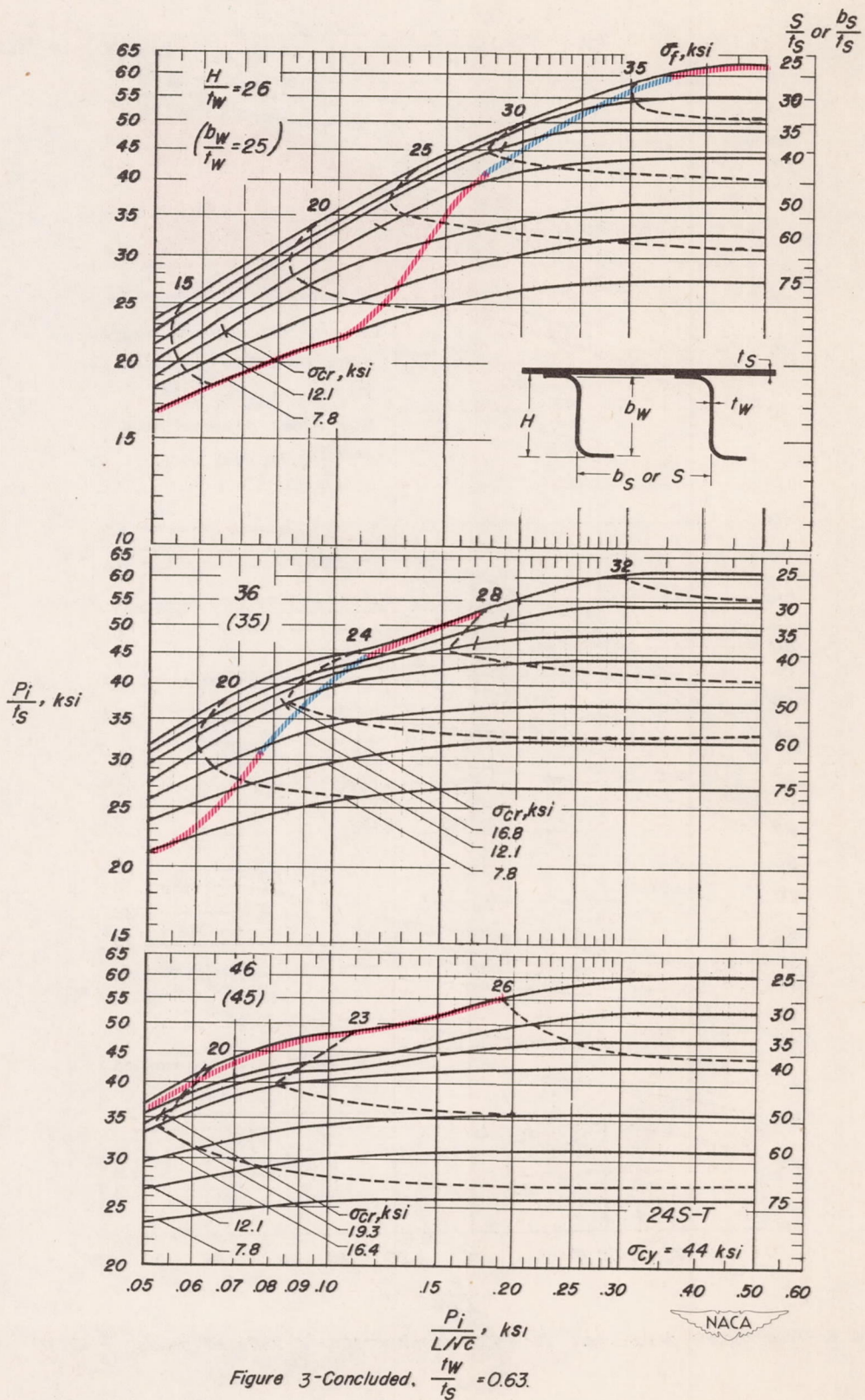


Figure 3.-Direct-reading design chart for 24S-T aluminum-alloy Z-stiffened panels, $\frac{t_w}{t_s} = 0.63$.



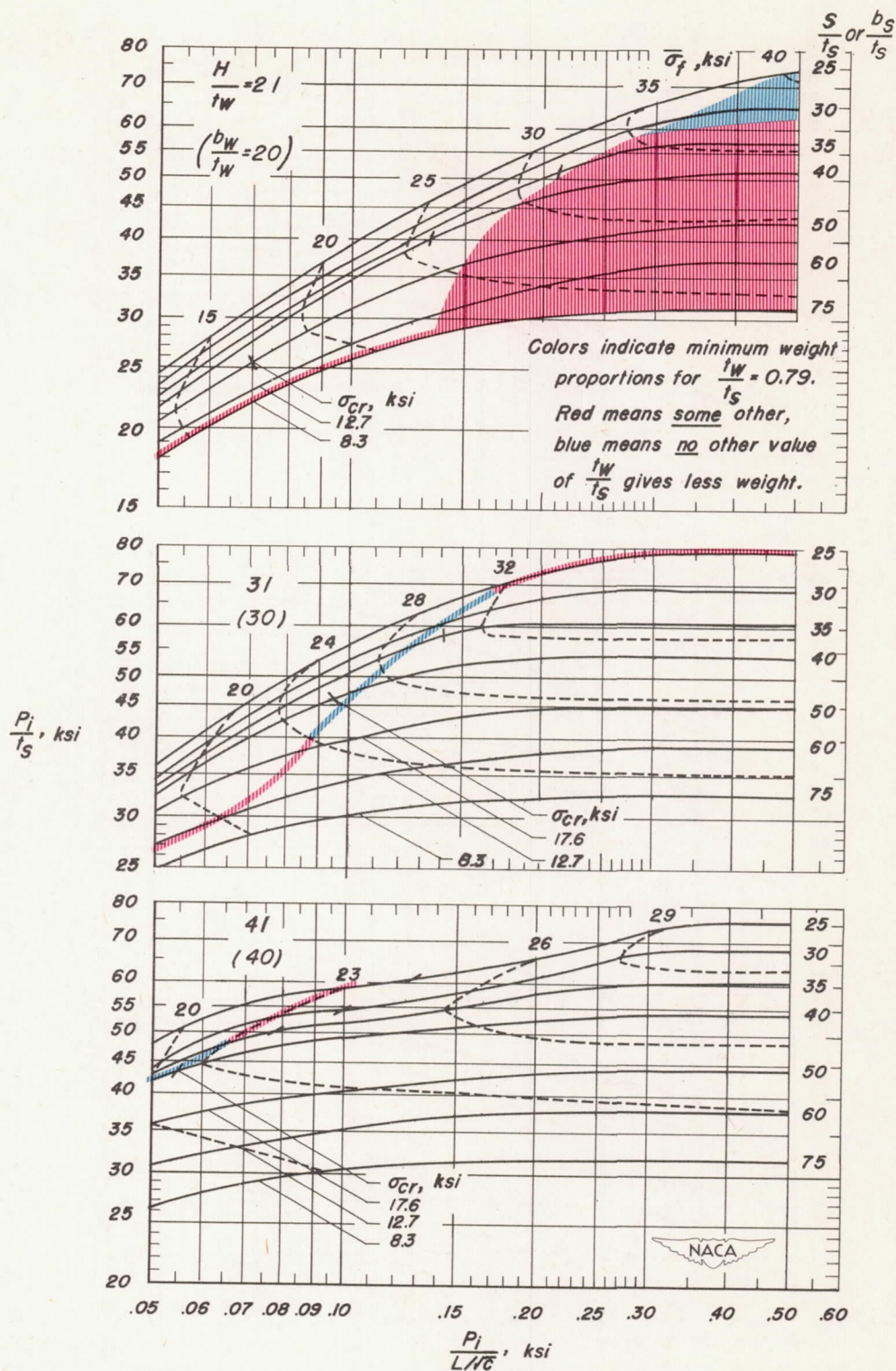


Figure 4.-Direct-reading design chart for 24S-T aluminum-alloy Z-stiffened panels. $\frac{t_w}{t_s} = 0.79$.

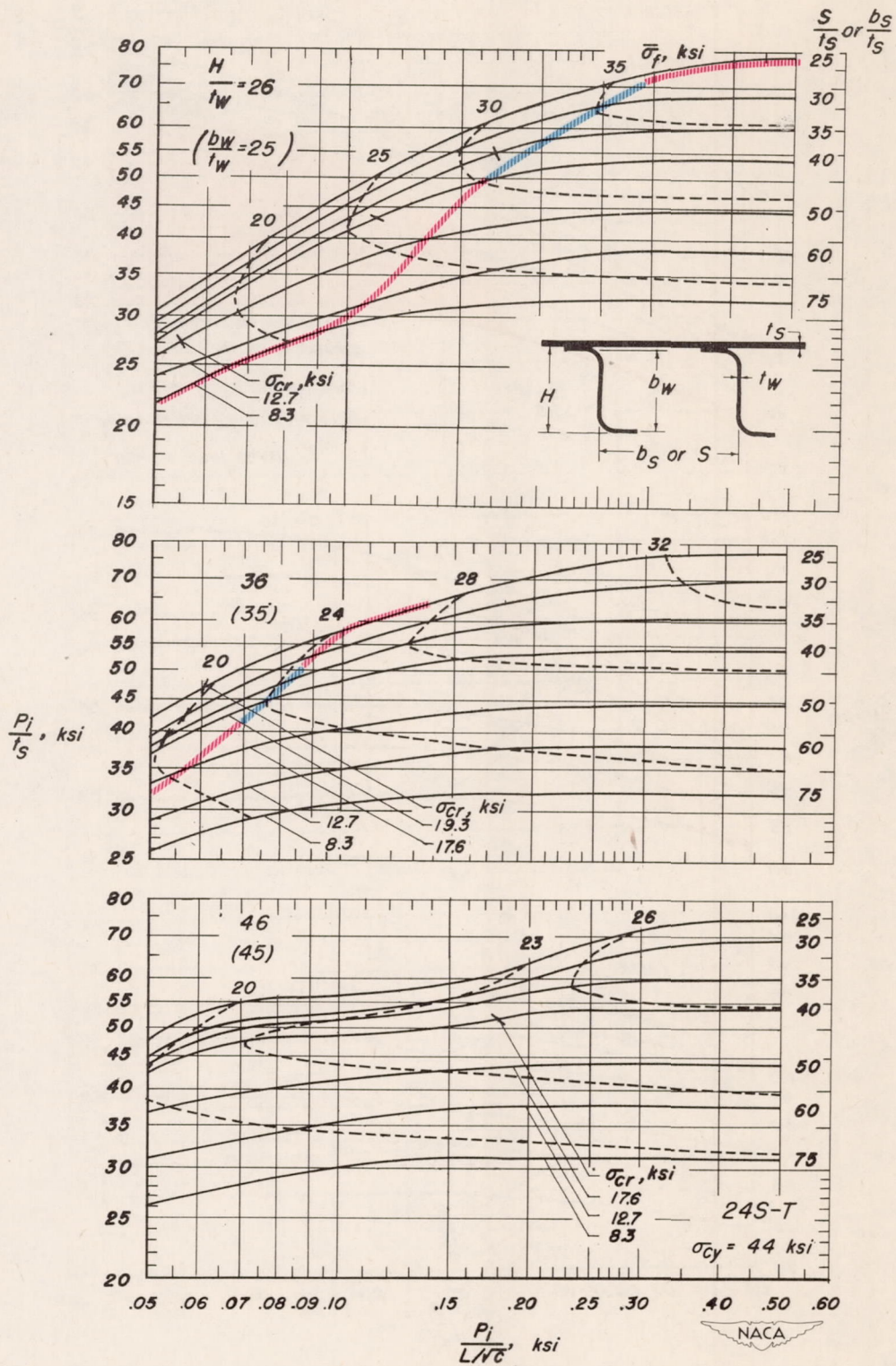


Figure 4. -Concluded. $\frac{t_w}{t_s} = 0.79$.

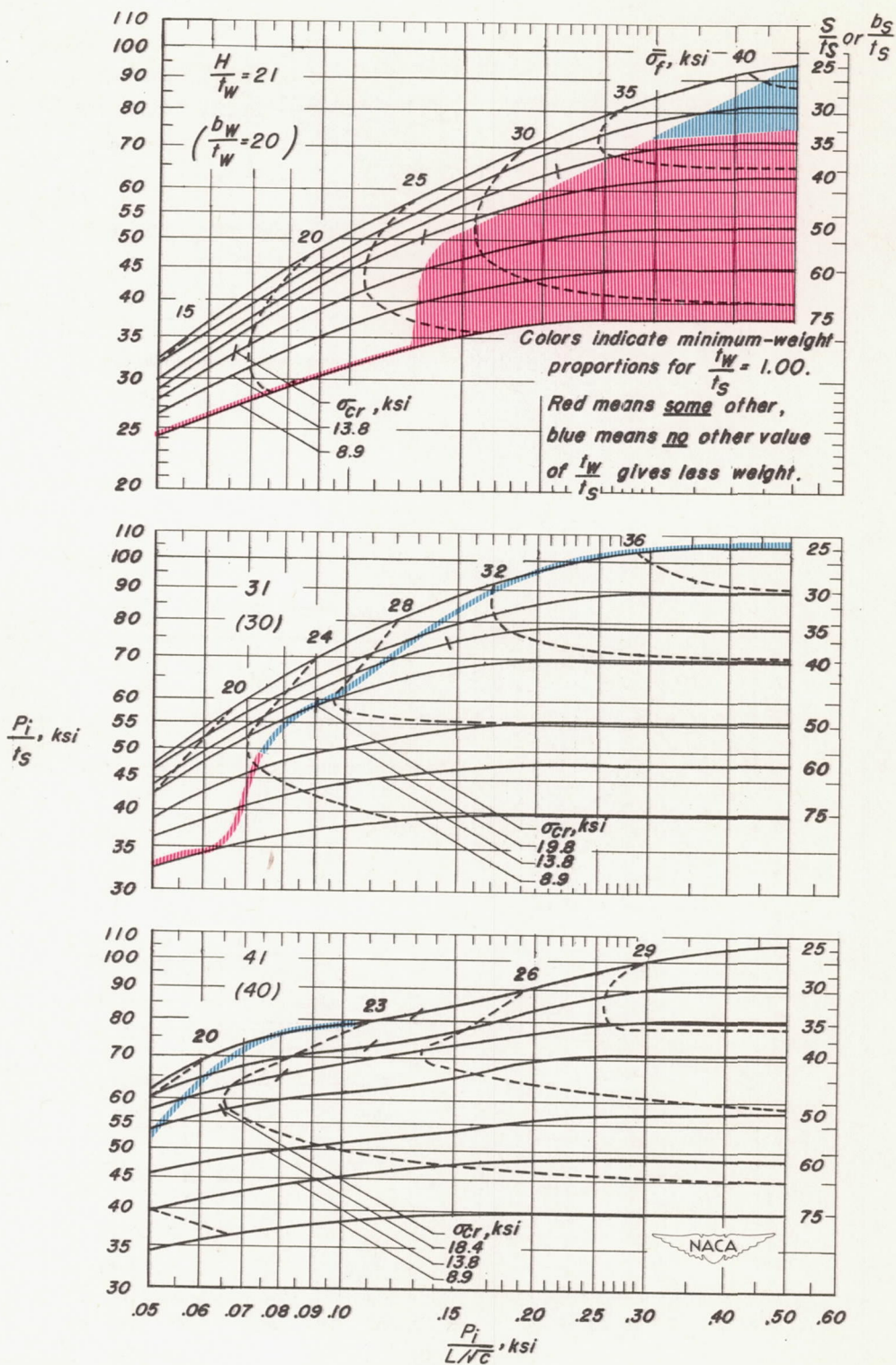


Figure 5.-Direct-reading design chart for 24S-T aluminum-alloy Z-stiffened panels. $\frac{t_W}{t_S} = 1.00$.

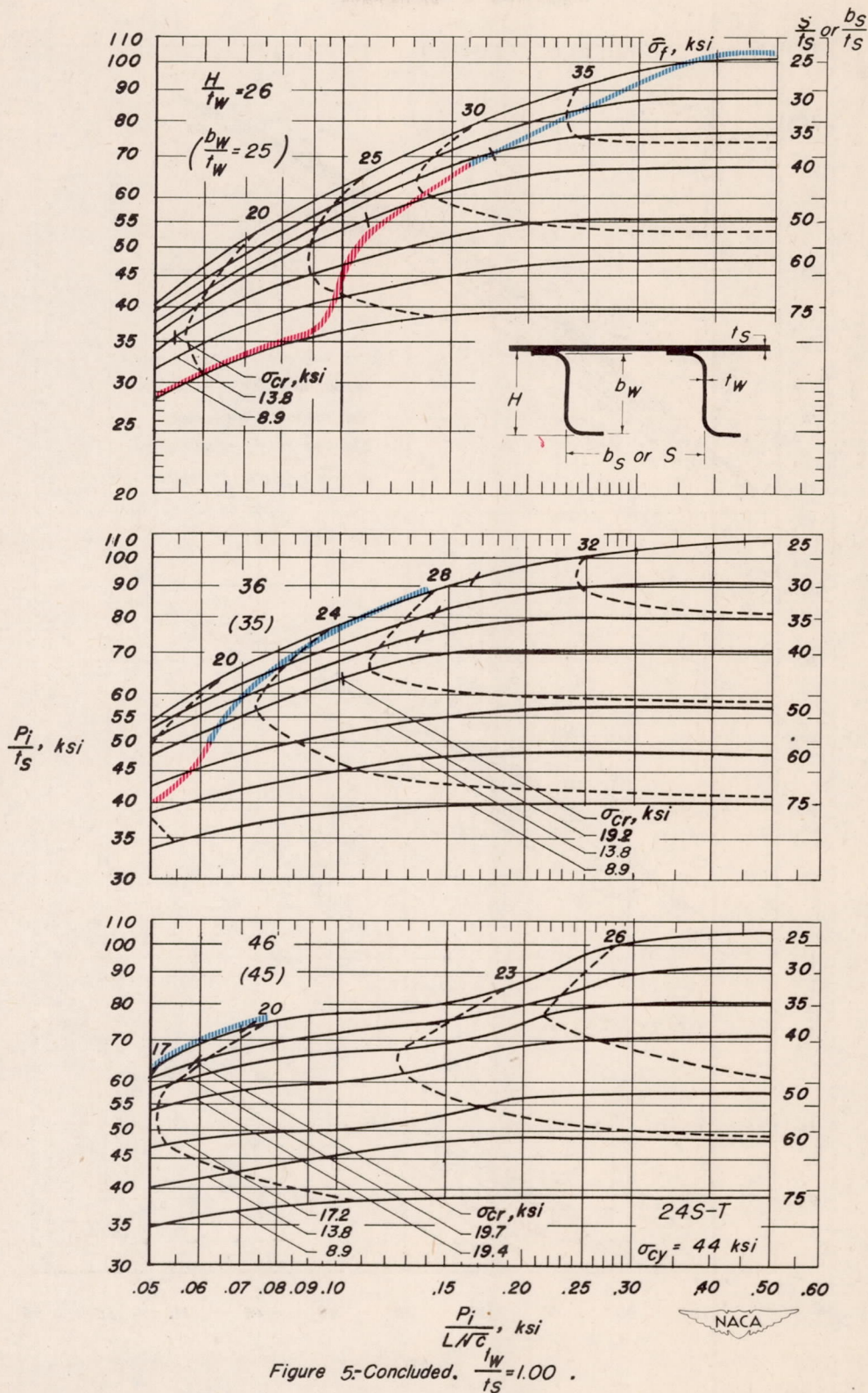


Figure 5.-Concluded. $\frac{I_w}{t_s} = 1.00$.

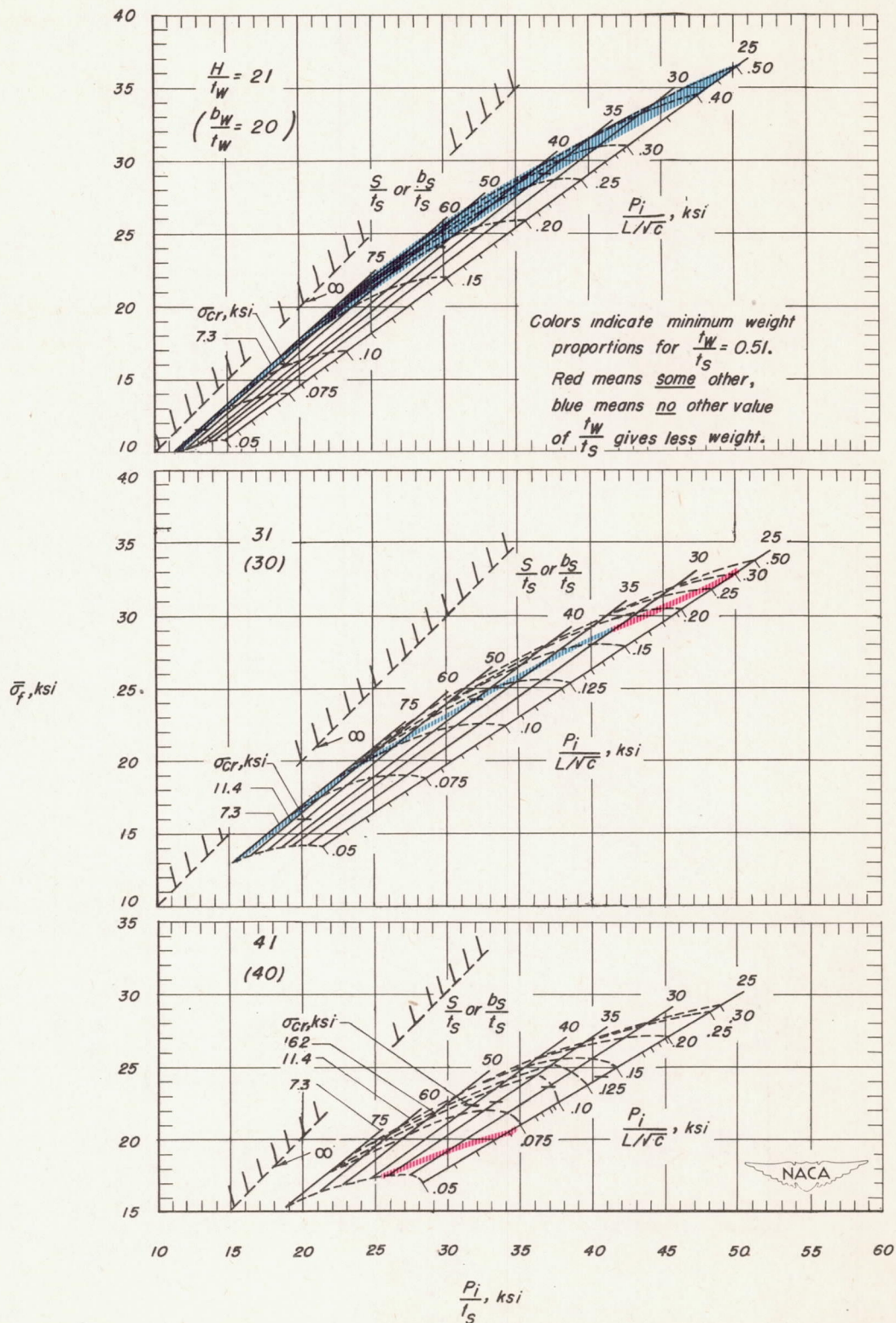


Figure 6.-Direct-reading design chart (alternate form) for 24S-T aluminum-alloy Z-stiffened panels, $\frac{t_w}{t_s} = 0.51$.

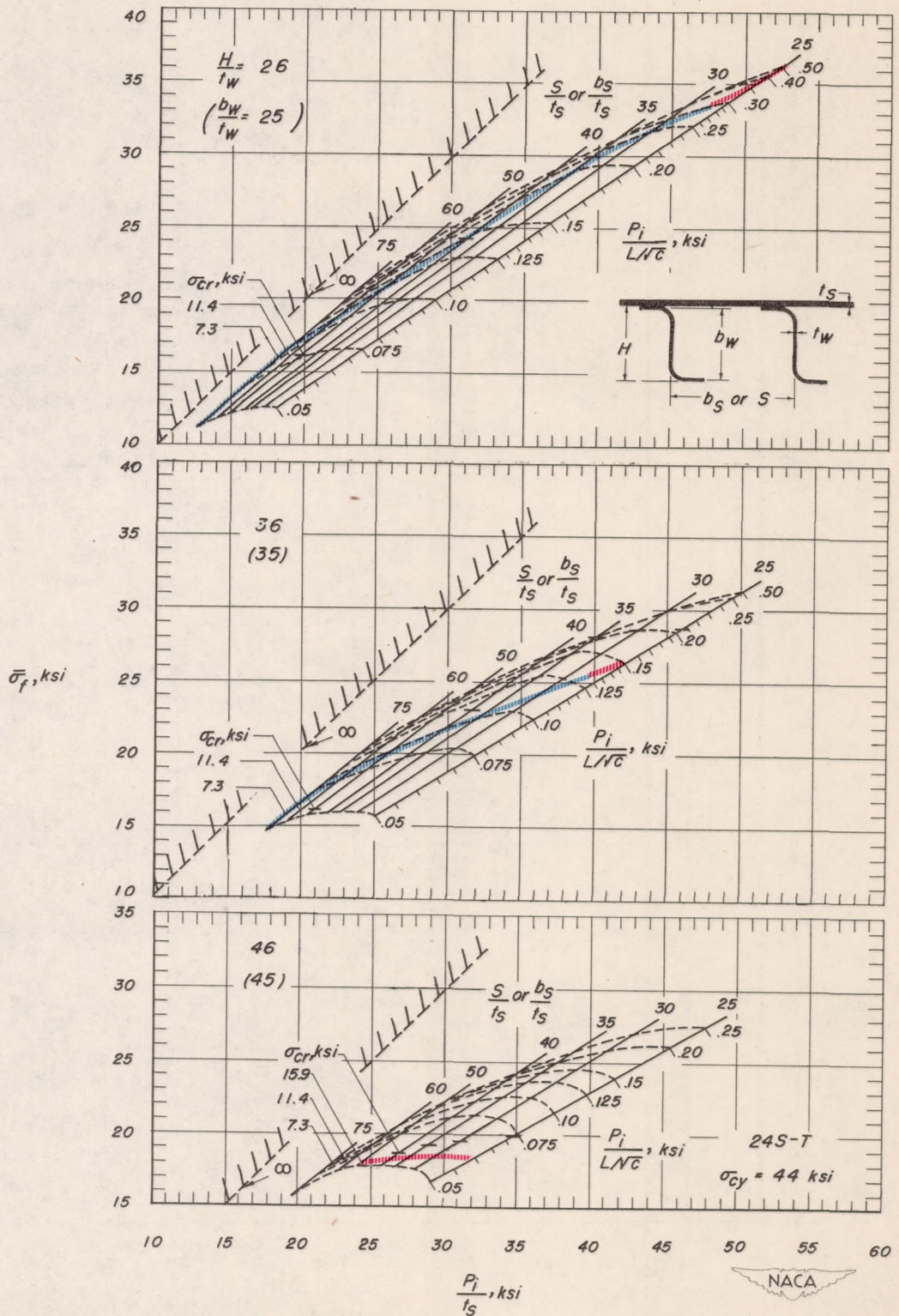


Figure 6.-Concluded. $\frac{t_w}{t_s} = 0.51$.

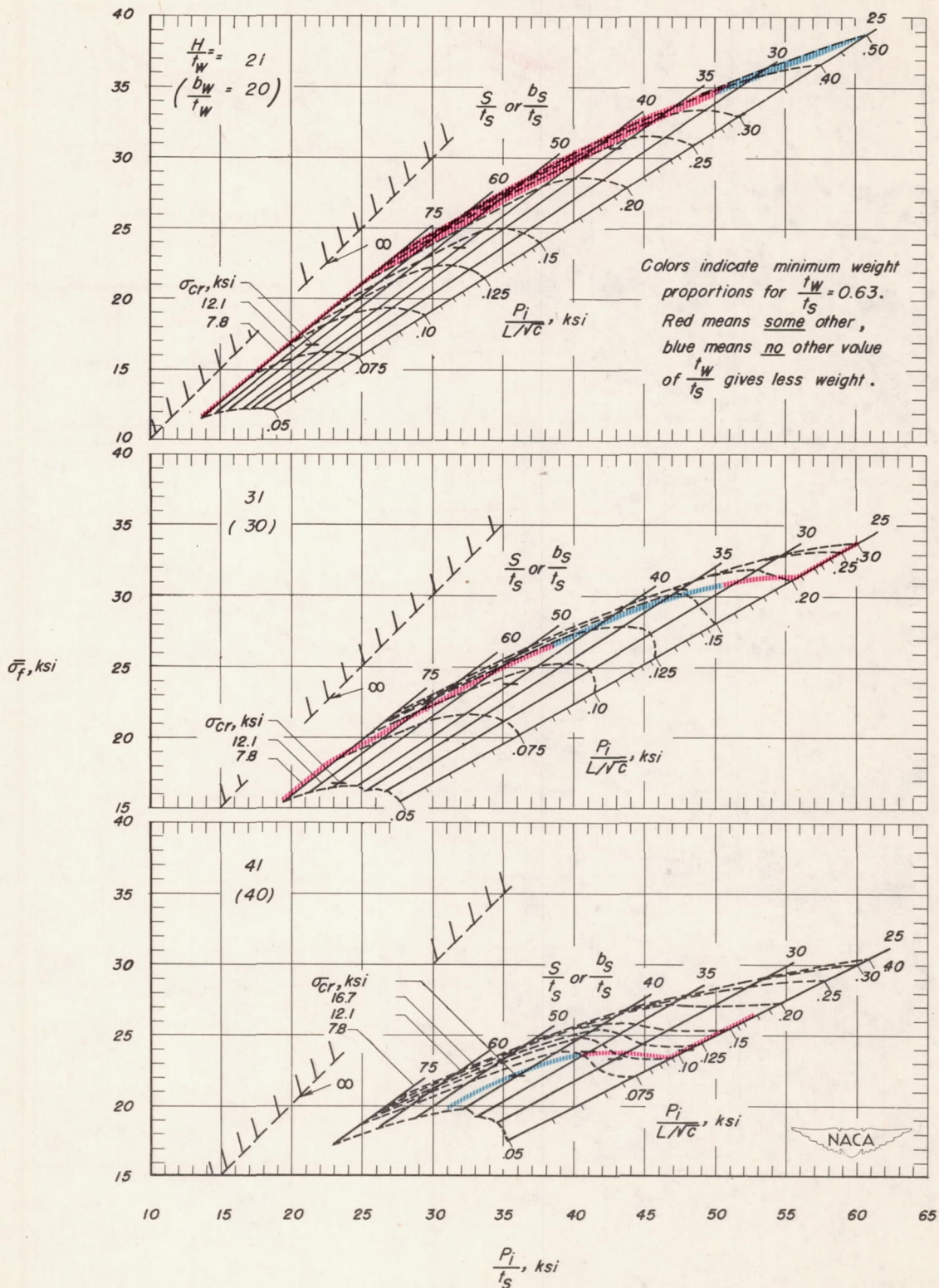
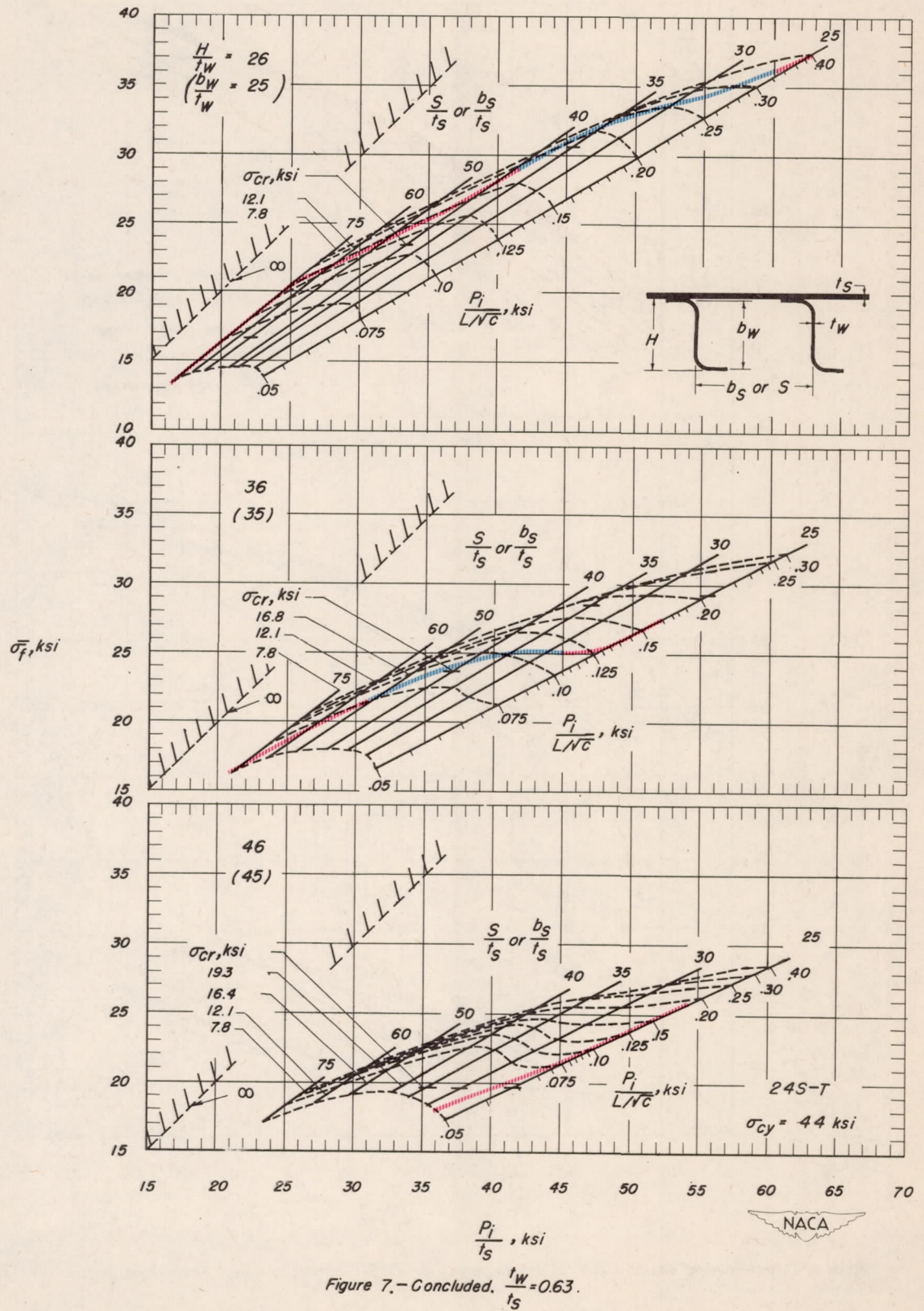


Figure 7.-Direct-reading design chart (alternate form) for 24S-T aluminum-alloy Z-stiffened panels, $\frac{t_w}{t_s} = 0.63$.



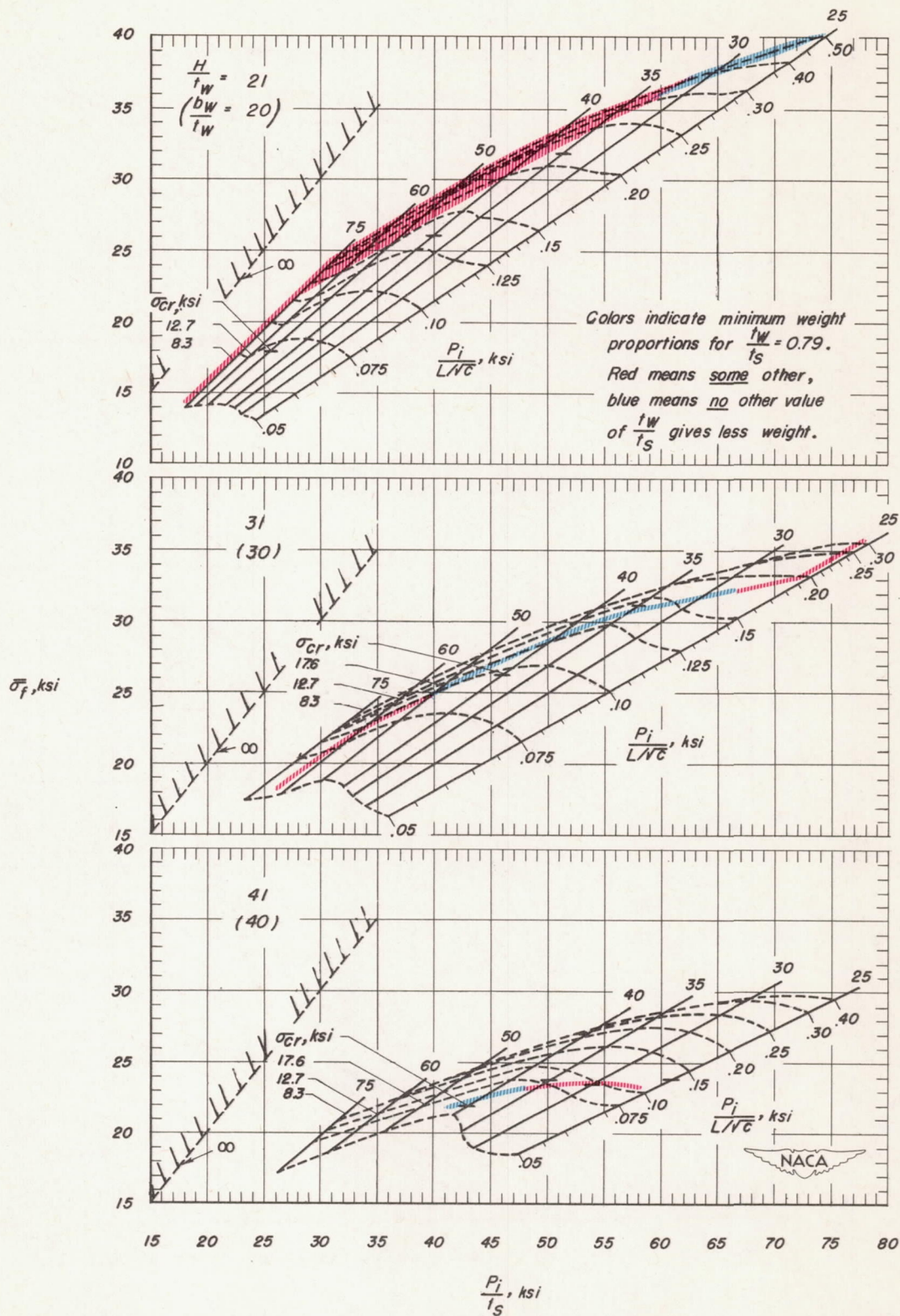


Figure 8.-Direct-reading design chart (alternate form) for 24S-T aluminum-alloy Z-stiffened panels. $\frac{t_w}{t_s} = 0.79$.

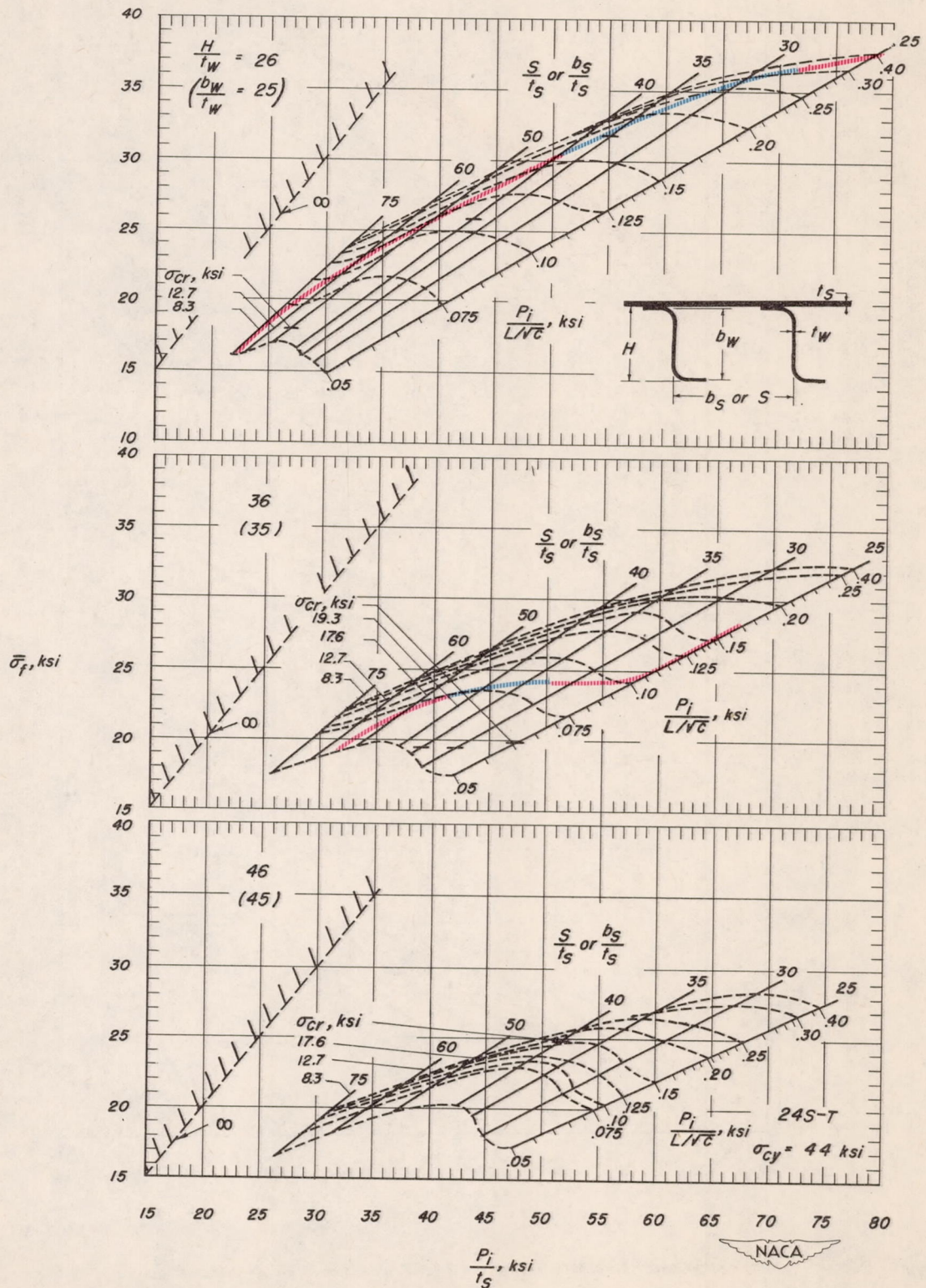


Figure 8.-Concluded. $\frac{t_w}{t_s} = 0.79$.

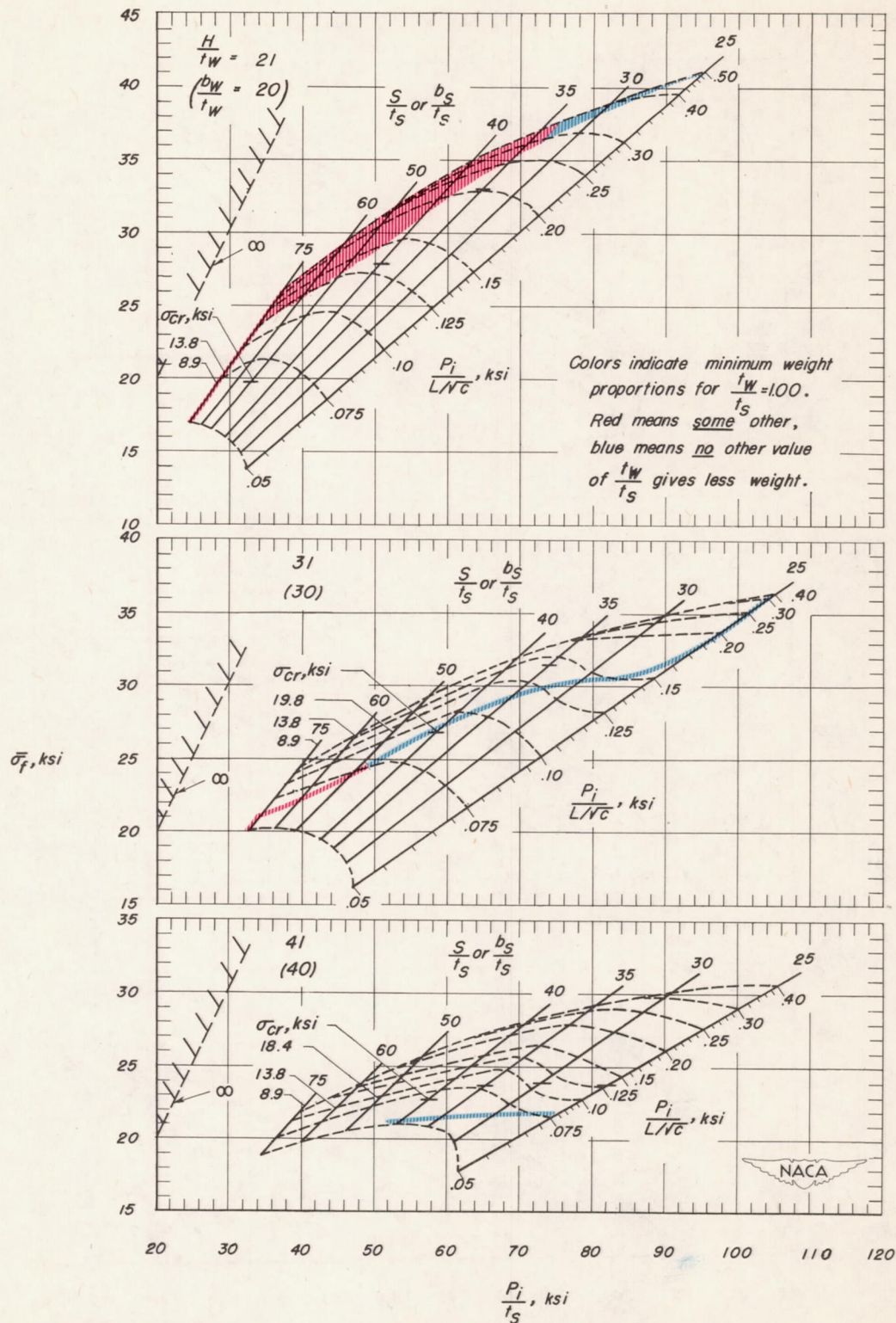
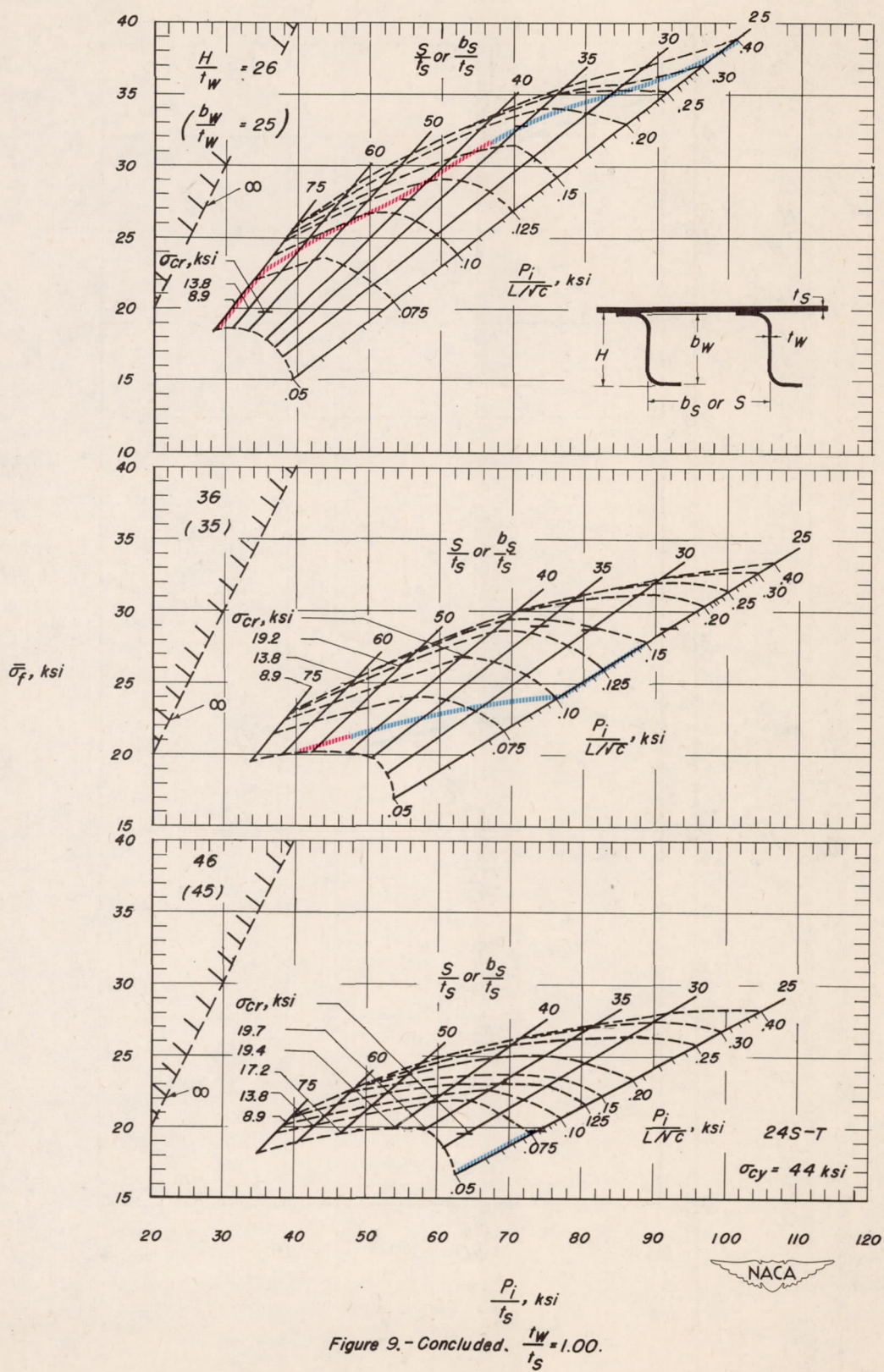


Figure 9.-Direct-reading design chart (alternate form) for 24S-T aluminum-alloy Z-stiffened panels. $\frac{t_w}{t_s} = 1.00$.



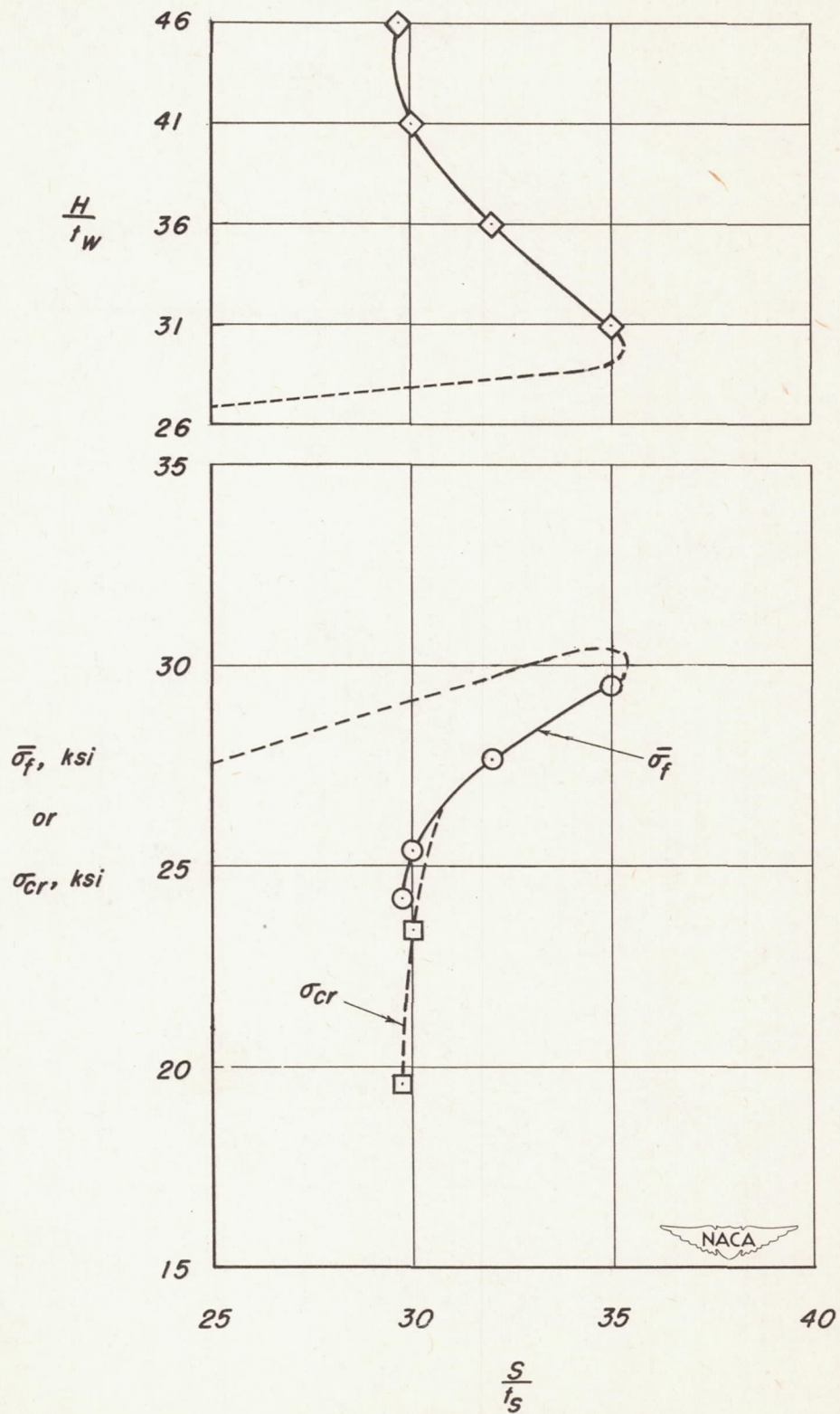


Figure 10.—Plot for obtaining design from design charts.